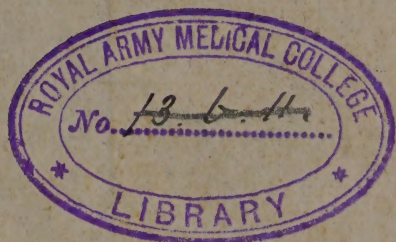




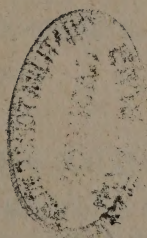
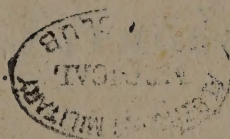
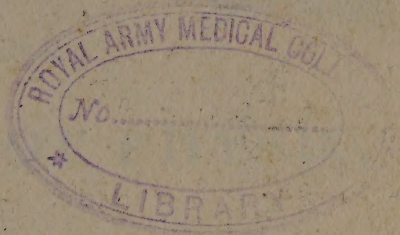
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OF THE

PRACTICE OF PHYSIC,

PRESENTING A VIEW OF THE PRESENT STATE OF

SPECIAL PATHOLOGY

AND

THERAPEUTICS.

BY

DAVID CRAIGIE, M. D., F. R. S. E.,

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS EDINBURGH,
PHYSICIAN TO THE ROYAL INFIRMARY, EMERITUS PRESIDENT AND
EXTRAORDINARY MEMBER OF THE ROYAL MEDICAL SOCIETY, &c.

VOLUME SECOND.

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ELEMENTS

OF

PRACTICE OF PHYSIC





PRACTICE OF PHYSIC.

VOLUME SECOND.

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V. INFLAMMATIONS OF CELLULAR MEMBRANE
AND ADIPOSE TISSUE.

VI. INFLAMMATION OF THE COMPOUND ORGANS.

VII. INFLAMMATION OF THE FIBROUS AND FIBRO-
SEROUS MEMBRANES.

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ELEMENTS

OF THE

PRACTICE OF PHYSIC.

BOOK II. CONTINUED.

CHAPTER III.

INFLAMMATION OF THE DIAPHANOUS OR SEROUS MEMBRANES.

Orrhymenitis. Hildenbrand.

THOUGH I stated in my Elements of Pathological Anatomy, that sundry reasons induced me to regard the arachnoid membrane as somewhat peculiar, yet convenience requires that we class it with the *pleura*, *pericardium* and *peritoneum* in delivering the history of the serous inflammations. I also observe this rule in the following general remarks on the inflammatory process in these membranes in general.

I. GENERAL PATHOLOGY OF SEROUS INFLAMMATION.—

1. When any serous or diaphanous membrane becomes inflamed, the first change which is observed to take place in it is diminution or loss of its transparent and glistening appearance. It becomes opaque, dull, and in some instances dry. “When inflammation,” says Hunter, “takes place in parts that have a degree of transparency, that transparency is lessened. This is probably best seen in membranes such as those membranes which have cavities, or cover bodies in those cavities, such as the *pia mater*; where in a natural state we may observe the blood-vessels to be very distinct.”—P. 281. At the same time red vessels may appear either in insulated spots, or over a considerable extent. These are generally arborescent, or parted into minute ramifications; in other instances they are like stars, or asteroid; and in some cases they form a confused net-work of red vessels. The free or polished surface of the membrane

is also perceptibly roughened. These changes, which may be regarded as the essence of the first state of inflammation occurring in serous membranes, are best seen in the *pleura* and *peritoneum*. After they have existed for some time, varying in different circumstances, other changes take place, which may be regarded as the effects of those already mentioned.

2. The first and most important of these is the secretion or formation of a new fluid at the free or unadherent surface of the membrane. This newly formed fluid varies according to the stage, and perhaps the kind of inflammation. When the process has only commenced, the free surface of the membrane is soon covered with a semitransparent homogeneous fluid, which sooner or later separates into a thick or coagulated portion, and a thin, serous, or watery one. The former is what has been termed *coagulating, or coagulable lymph*;^{*} and has been by some erroneously represented as separated or secreted in its solid form. There is now no doubt that it always appears first in the form of a fluid, and that its coagulation is a subsequent process, which depends on the quantity of albuminous or coagulable matter which it contains, and on the small proportion of mere fluid or serum. As the serous membranes are in all instances in corresponding application to each other, a very common effect of this effused substance and its coagulation is to connect more or less firmly the corresponding points of the membrane. The process by which this was accomplished was understood by Hunter and Baillie, and may be shortly stated in the following terms. As the lymph is thrown out and separated into clot or coagulable part, and fluid, the former is observed to be soon penetrated by minute red vessels, which may be demonstrated by injection; red spots like effused blood also appear through its substance; the corresponding points of the contiguous membrane, which are applied more or less constantly to the effused lymph, become at length attached; and the new vessels, after penetrating into them, shrink

* The term *coagulable lymph* is not expressive of this property as one which is inherent in the lymph itself; for many substances are capable of being coagulated though not spontaneously, yet by chemical means. Heat, for instance, coagulates the farinaceous part of vegetables, and forms vegetable albumen; spirit of wine coagulates all albuminous animal substances; acids coagulate milk, &c. The term, therefore, to be used respecting this property of the blood should be such as expresses its inherent power of self-coagulation. Perhaps *coagulating* might be better applied to what is called *coagulable lymph*; and the epithet *coagulable* might be left to designate the property of coagulability by heat or chemical agents.

and ultimately convey only colourless fluid. The process is termed *union by adhesion*, or simply *adhesion*; and the new membrane by which it is accomplished is termed membrane of adhesion, or false membrane. This is afterwards more particularly described when treating of peritoneal inflammation, in which it was observed by John Hunter. Part ii. Chap. iii. sect. vi.

3. Baillie and most other observers have noticed, besides this coagulating lymph, a serous fluid, yellowish, or brownish according to circumstances. There is no doubt that this is the serous or watery part of the effused fluid,—sometimes tinged with blood, and in some instances so copious, that no perfect coagulation takes place. Whether it be scanty or abundant, it generally contains flakes of coagulated matter floating in it. It is most copious when the inflammatory process has continued long, and when it has shown no tendency to spontaneous disappearance; and its best examples occur in inflammation of the *pleura*, and of the *peritoneum*.

The fluid secreted by an inflamed serous membrane varies in consistence. It may be limpid and transparent like clear water; it may be as thin as whey or turbid water; it may be like milk, yellow or red-coloured; and it may be as consistent as cream, or, in short, it may be well-formed purulent fluid. The watery colourless secretion resulting from the process of inflammation is rare; and perhaps does not occur in the serous membranes generally. It is seen often, however, in the arachnoid membrane, or rather the arachnoid surface of the cerebral membrane (*pia mater*;) and is almost a uniform result of inflammation of that division termed the *choroid plexus*, and which constitutes the disease named *water of the brain* (*hydrocephalus*, *hydrencephalus*.) The turbid watery, or whey-like effusion, is most generally observed as a consequence of inflammation of the *pericardium*, and sometimes of the *pleura*, in the diseases named by practical authors *dropsies*, (*hydro-pericardia*, and *hydro-thorax*.) The other forms of most consistent secretion in the shape of puriform or purulent secretion are observed in varieties of inflammation of the *pleura* and *peritoneum*.

4. It was at one time believed that purulent matter could not be formed by these membranes unless the process of ulceration previously occurred, or without breach of surface, as it is termed. Instances of *empyema* or purulent collections within the chest, without ulceration of the *pleura*, and of puru-

lent matter within the abdomen without breach of the *peritoneum*, ought to have led pathological writers to the inference, that suppuration might occur in a serous membrane without ulceration, and that secretion of purulent matter was one of the effects of simple inflammation. The truth of this fact, however, does not appear to have been established before the time of William and John Hunter, the last of whom notices it as a point not previously ascertained or generally admitted. After speaking of the transition or gradual change from coagulable lymph to purulent matter, he infers "that suppuration takes place in serous surfaces, without a breach of solids or dissolution of parts, mentions it as a circumstance not commonly allowed," and appears to consider this suppuration as a more advanced or ulterior stage of the process, than that which gives rise to effusion of mere lymph and union by adhesion. He afterwards states, in a note on this passage, that he first came to the knowledge of this fact in 1749 or 1750, when, in a young subject which came under inspection, the left side of the chest was found to contain a considerable quantity of purulent matter without breach of the *pleura* or surface of the lungs; and at the same time Dr Hunter and Mr Samuel Sharpe regarded it as a new fact. Since that period it has been often observed both in inflammation of the *pleura* and of the *peritoneum*; and as such has been mentioned by Hunter and Baillie.

"Another kind of pus," says Dr Hunter, "is that which is formed without any apparent breach or dissolution of the solids, and, therefore, is only a sort of inspissated serum; or an inflammatory exudation. We occasionally meet with collections of this kind in all the natural external cavities of the body. I have seen it in great quantity in the cavity of the *abdomen*, or of the *peritoneum*, in that of the *thorax* or of the *pleura*, and in the *pericardium*; where there was no visible suppuration, ulceration, or dissolution of the solids, or any part of the surface all round. This kind of *pus* is generally thinner than that of an abscess, and the containing surface is more or less covered with a glutinous concretion or slough of the same colour as the fluid, in some parts adhering very loosely, in others so firmly, that it can hardly be rubbed off; but still the surface covered by these sloughs is without ulceration or loss of substance."—*Medical Inquiries and Observations*, Vol. ii. p. 61.

The inflamed serous membrane may secrete purulent matter either from its own surface, or from a covering of coagu-

lable lymph. In the first instance the inflammatory process appears at once to give rise to the formation of puriform or purulent fluid; in the second it first forms coagulable lymph, and the layer of this matter then assumes the suppurative action. These facts are best seen in instances of chronic pleurisy, and of chronic inflammation of the peritoneum.

5. A second effect of inflammation of the serous membranes is effusion or secretion of fluid in the subserous cellular tissue. This tissue connects the proper serous membrane either to the organ which it encloses, the part which it covers, or the membrane to which it is attached, and in certain circumstances, when the inflammatory process takes place in the serous membrane, it is followed by formation of fluid in the subjacent filamentous tissue. Thus when the arachnoid membrane is inflamed, it is exceedingly common for the delicate cellular tissue which connects it to the vascular membrane, (*pia mater*,) to be distended with serous fluid more or less transparent. This change makes the arachnoid membrane look as if it were raised or detached from the *pia mater* by a transparent or slightly opaque gelatinous matter, uniformly spread between them. If a puncture or incision, however, be made, only a small portion trickles out, being that which is immediately exposed by the incision. The fluid of the contiguous parts does not escape; and this, together with actual inspection, shows that it is contained in interstices or cells, or intermediate spaces formed by the mutual crossing of the subserous cellular tissue. In some instances coagulable lymph is effused in the same manner,—more especially at the base of the brain. In inflammation of the *pleura*, this effusion is perhaps less common, unless the substance of the lungs be at the same time inflamed. This appears to depend on the intimate union between the pulmonic substances and their serous membrane. In inflammation of the *peritoneum* again it is more common; and careful observation may detect effusion not only below the intestinal *peritoneum*, but more distinctly in some instances below that which lines the abdominal muscles. Patches of purulent fluid even may sometimes be found in the sub-peritoneal cellular tissue; and this is seen not only in the ordinary forms of peritoneal inflammation, but in that which takes place in the persons of puerperal women, in whom it is often deposited in numerous patches in the subserous cellular tissue of the womb.

6. A third change which has been mentioned as the consequence of inflammation in serous membranes is their becoming thicker than natural. The occurrence of this change has been contradicted, however, by Laennec, who denies that thickening of the *pleura* is a consequence of its inflammation, and contends that observers have been misled by morbid deposition on its surface, or the formation of new membranes. As Baillie has expressly mentioned thickening as a consequence of inflammation in the *pleura*, *peritoneum*, and mesentery, as the personal observations of Pemberton and Black confirm this with regard to the *peritoneum*, and as the question, therefore, resolves itself into one of individual observation, it is still incumbent to notice the fact in a systematic work. Though I do not regard it as proper in such circumstances to dwell on my own testimony, personal observation leads me to say, that in all the instances of inflammation of the *pleura* and *pericardium* which I have examined during a series of twelve years, I have found none in which the membrane was thickened, and none in which the apparent thickening was not produced by the deposition of coagulable lymph. I have to observe, on the other hand, that effusion of lymph into the subserous filamentous tissue is very common, and not unfrequently may cause the appearance noticed as thickening of the membrane; and in the case of the arachnoid membrane and the *peritoneum* particularly, the infiltration of sero-albuminous fluid is very common, and gives rise in the former membrane to something like thickening. In *peritonitis*, sero-albuminous fluid or even purulent matter in patches is deposited beneath the muscular *peritoneum*, and in puerperal *peritonitis*, beneath the uterine and ovarian *peritoneum*. In some instances the serous membranes become brittle and lacerable in consequence of inflammation; and in cases of gangrene they become pulpy or softer than natural.

7. The next effect of the inflammatory process in serous membranes is destruction of their tissue by ulceration. This is not common in the acute form of the disease; but after it has subsisted some time, one or more points of the membrane begin to be affected by the ulcerative process, which at once spreads superficially, and penetrates through the membrane; or the latter becomes brittle, and gives way in round irregular patches, or in ragged linear fissures. This process is not equally

common to all the serous membranes; it is most usual in the *pleura*, pulmonic or costal, and in the intestinal *peritoneum*.

Ulceration has been ascribed by some pathologists, and among others by Hunter, to the pressure exercised by the purulent matter; and thus indeed the last author explains the tendency which collections of matter manifest to proceed toward the surface. There is no doubt that the pressure of such agents must act as an irritating cause; and may therefore produce what Hunter terms *ulcerative inflammation*. In several examples, however, it would appear that ulceration may occur as a direct effect of inflammation, without the formation of matter sufficient by its pressure to cause destruction of the serous tissue. The ordinary cases of empyema and of chronic inflammation of the *peritoneum* often present both a good example of the last disease as given by Hunter, p. 461, 4to, on the relaxing process. Part ii. Chap. vi. sect. vi.

8. Observation has not yet perfectly determined whether gangrene is an effect of inflammation of the serous membranes. There is no doubt that they are occasionally involved in this process, as is seen in the *pleura* in gangrene of the lungs, and the *peritoneum* in gangrene of the bowels; but it is still uncertain whether primary inflammation of a serous membrane may terminate in mortification of that membrane. Ulceration with bloody effusion, or blood-coloured patches, must not be confounded with this process. Bichat states, that in numerous bodies which he had inspected, he had met with gangrene of the *peritoneum* only; and that he never witnessed an instance of this change, either in the arachnoid membrane or the *pleura*, in the *pericardium*, or in the vaginal tunic of the testicle.—(Anatomie Générale, Tom. ii. p. 517.)

9. These observations apply chiefly to those forms of inflammation which practical authors term acute, or subacute. They may also be applied to several examples of chronic inflammation, when this differs from the acute only in its longer duration and less marked phenomena. There is, however, one form of chronic inflammation which differs from this process in the serous membranes in ordinary circumstances, by the nature of the new products to which it gives rise, and probably, therefore, by possessing a distinctive pathological character. This inflammation is attended with the formation of minute bodies like millet seeds, which eventually enlarge, and form what are called tubercles of the *pleura* or *peritoneum*, according as they appear in

the one or other membrane. Bichat justly remarks, that the formation of these minute bodies peculiarly distinguishes the organic characters of the serous membranes. It is not improbable that these eminences form one of many varieties of chronic inflammation, to which these membranes are liable.

10. Haller was led, by various observations and experiments, to conclude that the serous membranes possessed a low degree of animal sensibility, or at least, that they did not so readily or quickly as some other tissues, manifest those marks which arise from injury offered to their organization.

This doctrine received confirmation from the experiments and arguments of his disciples, Zimmerman,* Castell,† and Krause.‡ The second author especially exposed the *pia mater* with the arachnoid, the *pleura* and the *peritoneum*, in living animals, and applied to them nitric acid, or hydro-chlorate of antimony, and pricked or tore them, without perceiving in the animals any unequivocal indications of suffering. This doctrine of the insensibility of the serous membranes in the sound state was by most of these authors placed in connection with the anatomical fact, that they are void of nerves, or that nerves, though seen to pass along them, are not ramified through their substance. It would have been a better, and perhaps a more philosophical course, to have attempted to ascertain whether these membranes possess sensibility, without reference to their containing nervous filaments.

This opinion Monro the second verified. In three cases, in which the chest was punctured, he introduced within the chest a crooked probe, and rubbed the point of it against the *pleura*, yet the patients did not complain of pain. And in another case, he introduced a long bougie into the chest, and on turning it round, the patient felt something moving, but did not suffer pain. He also repeated the experiments of Haller on the lower animals; cutting away the intercostal muscles, pricked and even tore the *pleura*, but the animals did not seem to suffer from it.§

* D. Zimmermann, Dissert. de Irritabilitate. Gottingæ, 1751.

† Petri Castell, Experimenta quibus varias Corporis Humani partes sentiendi facultate carere constitit. Gottingæ, 1753. Apud Ludwig, Vol. iv. p. 133, sectio iv. v. et vi.

‡ Caroli Christi Krause, de Sensibilibus Partibus Humani Corporis. Lipsiæ, 1765. Apud Ludwig, Scriptorum Neurolog. Vol. iii. p. 185, §. xxv. and xxvi.

§ The Morbid Anatomy of the Gullet, Stomach, and Intestines, by Alexander Monro Junior, M. D., F. R. S. E. 1811. P. 269.

These inferences Bichat confirmed, but modified. He showed that, in the healthy state, these membranes are almost, if not, entirely insensible; and that, when freely handled, or otherwise exposed to foreign bodies, they communicate only an obscure and indistinct tact; but that they are liable to be affected by the morbid state of the adjoining organs, and betray various proofs of sensibility. It is obvious that this is to admit their sensibility during the state of disease; and, in point of fact, it cannot be denied, that, in various diseased states, the serous membranes give rise to acute pain. It may, however, be answered, that there are numerous examples of inflammation of the *pleura*, *pericardium*, and *peritoneum*, in which the disease has gone on for weeks, without giving rise to much pain, sometimes without any, and finally terminated fatally, with no prominent or conspicuous complaint of local uneasiness. In such cases of disease, which are the latent inflammations of some authors, and the chronic inflammations of others, how does it happen that the *pleura* continues insensible, while it is the seat of acute pain in a pleurisy of three days standing? I have seen an instance of disease of eight or ten days' duration, in which the symptoms were mere general uneasiness, and occasional slight palpitation, and at last convulsive motions, not unlike those of *chorea*; yet examination after death showed general inflammation of the *pericardium*, with effusion of lymph. The absence of pain in such cases is perhaps partly to be ascribed to what physiologists have termed *a low degree of sensibility*, which may be augmented under certain circumstances of the acute disease, but remains stationary in the chronic,—and partly to the violence and kind of the inflammatory process. It will perhaps appear that this is merely a mode of expressing in different terms a fact which cannot be explained, and of which we remain equally ignorant while we thus express ourselves.

II. GENERAL SEMIOGRAPHY OF SEROUS INFLAMMATION.—

The symptomatic effects which inflammation of the serous membranes causes, may be resolved into morbid changes in the functions of the organ or organs with which the affected membrane is connected, and morbid changes in the circulation and its dependent functions.

1. No serous membrane can be inflamed without giving rise to various derangements in the healthy state of the organ which

it invests. When the arachnoid membrane is diseased, sensation, perception, memory, judgment, and other faculties, the sound exercise of which depends on the sound state of the cerebral circulation, become disordered. Vision double or indistinct, morbid acuteness of hearing, giddiness, loss of memory, incapacity of judgment, are uniform attendants on meningeal inflammation. In pleurisy, besides the pungent pain of the side, the breathing becomes quicker, more limited, and more laborious than natural, is performed mostly by the diaphragm and abdominal muscles, while the ribs move imperfectly, or is attended with frequent coughing, and sometimes the exhalation and mucous discharge from the bronchial membrane is disordered. In like manner, when the *peritoneum* is inflamed, besides the pain of the belly, which is aggravated by pressure, coughing, or a deep inspiration, the breathing is performed chiefly by the ribs, and less by the diaphragm. The bowels are in most instances obstinately bound; sometimes the patient is distressed with sickness and vomiting, when the gastric *peritoneum* is affected; and in some instances, the stools are frequent, fluid, and unnatural.

2. The influence which inflammation of the serous membranes exercises on the circulation varies according to the membrane affected, but is generally considerable. The contractions of the heart, transmitted along the arteries, are more frequent in a given time, generally by one-half or double, and are performed with a hard vibratory motion, which gives the artery a wiry contracted feel. The first constitutes the quick pulse, the second the hard, corded pulse, so often mentioned by practical authors as an attendant on inflammation of the serous membranes. Such is the state of pulse generally in meningeal inflammation at its commencement, in pleurisy, and in peritoneal inflammation without affection of the stomach or small intestines. When the gastric, duodenal, or enteric *peritoneum*, is inflamed, the pulse is small, wiry, languid, and in general creeping, or what some authors have termed *vermicular*. In some few instances of inflammation of the *pleura*, the pulse has been found not quicker than natural, unless matter was secreted when it became habitually frequent, or what is termed hectic. In instances of meningeal inflammation, also, it has been remarked to be not much quicker than natural, till immediately before the fatal termination, when it becomes very rapid, irregular, and intermittent.

In the functions dependent on circulation similar changes take place. The cutaneous secretion is rendered very irregular, being at first almost checked, and afterwards unnaturally augmented at intervals, thus giving rise to partial and excessive sweatings and chills. The mucous secretion is also disordered, giving rise to thirst, and general dryness of the mucous membranes. The urinary secretion is diminished, and what is secreted is unusually high-coloured, and generally deposits a sediment. When the inflammation becomes chronic, this is what is termed the brick-dust or lateritious sediment. Of the biliary secretion we know too little to speak with confidence.

III. GENERAL ETIOLOGY OF INFLAMMATION OF THE SEROUS MEMBRANES.—The causes to which inflammation of the serous membranes may be traced are very various, but may be arranged in the following order. The first are general predisposing causes; the second includes the whole of those circumstances which may act as exciting causes.

Under the first head, I would arrange, 1. General disposition, or a certain proneness presented by some persons to inflammation of the serous membranes; 2. The long-continued influence of telluric *miasmata*; 3. The strumous diathesis, whether original or acquired; 4. The presence of disease of the kidney; and, 5. The state of the system in females during pregnancy.

To the second head I refer such circumstances, as external violence, injury, or contusion, exposure to cold or moisture, exposure to excessive heat, as in the case of insolation.

A. 1. As to the first of these predisposing causes, we find that in several persons there is a liability to inflammation of different serous membranes, simultaneously or successively. Thus, in a person who has laboured under inflammation of the *pleura*, it is not uncommon for pericardial inflammation to be afterwards developed; and in some instances, in the same individual, *pleuritis* and *peritonitis* are observed to co-exist.

2. This co-existence of inflammation of different serous membranes is doubtless observed most commonly in the persons of those who have been long subjected to the operation of telluric and marsh *miasmata*, without giving rise to ague or remittent fever, and hence may be regarded as the result of the long-continued operation of a powerful morbid agent,

concurring with specific causes in directing the phlogistic action more pointedly on the serous membranes.

3. In certain persons, however, it is observed that a great disposition to serous inflammation is evinced, without its being possible to trace this disposition either to miasmatic influence, or any other palpable cause. But as this disposition, which, though most commonly observed in young subjects, is also seen in adults, is very generally, if not uniformly, associated with more or fewer of those marks which are conceived to indicate the presence of the strumous diathesis, and as the disease very often in these persons comes on and advances to a considerable length without pain, or with little or no uneasiness in the side, it is therefore inferred that in this case the origin of the disease is to be ascribed to the predominance of this strumous diathesis. Illustrations of the influence of this cause are most appropriate under the head of the individual serous inflammation. But it is proper here to remark, that the meningeal and meningo-arachnoid inflammation, which terminates in water within the brain, though incident to all, is most common in those of strumous habit and appearance.

4. It is an interesting fact, in pathology, that a cause of serous inflammation, by no means uncommon, is disease of the kidney, especially its cortical or secreting tissue. The researches of Dr Bright have made the pathologist acquainted with the existence of a peculiar change in the structure of this organ, in which it may become either much congested, with an irregular tuberculated appearance of the surface, or its cortical matter may assume various shades of light-red, fawn-colour, orange, or yellow, or even cream-white, and part of this tissue may disappear, or be much smaller in size and volume than natural. The urine then contains more or less albuminous matter, the presence and proportion of which may be determined by coagulation, by heat, or the addition of acids, or any of the metallic salts; and it is also generally less dense than natural. As the density of the urine, which on an average varies from 1020 to 1025, or 1026, depends chiefly on the presence of saline matter and urea; and as the saline matter is not always diminished in the same ratio in which the coagulable matter is increased, it is inferred that the diminished density is connected with the diminished proportion of urea in such urine.

Persons, young or adult, in whom the changes now mentioned in the renal structure and secretion have taken place, are remarkably liable, on the application of very slight causes, to the occurrence of inflammation, sometimes in the mucous membranes, but more generally in the serous membranes; and very frequently the disease proves fatal, by the induction of inflammation either of the cerebral membranes, of the *pleura*, the *pericardium*, or the *peritoneum*. In some instances this inflammation is acute in form and rapid in progress, with the effusion of coagulable lymph from the free surface of the membranes. In other instances it is less violent and marked in symptoms, and slower in progress, and gives rise to an effusion of sero-albuminous fluid from the free surface of the membrane or membranes, so as to constitute a true dropsical collection. In the latter instance the dropsy is said to be of inflammatory origin, or to depend on disease of the kidney; (*hydrops renalis*.)

As the proportion of urea, the characteristic principle of the urine, is in this disease diminished, or at least is not excreted from the system, it is inferred that it is retained within the economy, and that its presence, by circulating in the blood-vessels, and being applied to the membranes, may in this manner irritate them, and induce in them the inflammatory disposition, which, on the application of exciting causes, as cold, moisture, &c. is forthwith converted into the actual inflammatory process. It is perhaps of no great moment whether it be understood that the urea is retained within the system in the form of perfect urea, or whether only its constituent principles are retained. It is sufficient to know that the usual proportion of azote, the incessant elimination of which is necessary to the healthy state of the different functions, is not excreted. The presence of such a principle within the system probably always implies a disposition to vascular injection and inflammation, ready to be roused into action on the application of exciting causes; and perhaps the converse may be also admitted to be near the fact, viz. that the phlogistic or inflammatory diathesis is often, if not always, associated with imperfect action of the secreting organs.

Analogy, indeed, would lead to the inference, that similar inflammatory dispositions may be connected with, if not induced by, similar morbid states and impaired functions of other glands.

Thus disease of the liver may, in the same manner, by retaining within the system principles, as picromel and cholesterine, which ought to be eliminated, give rise to the same irritation, and the inflammatory state of the serous membranes. Even any disorder of the skin which greatly impairs its secreting function may induce a tendency to inflammation of the serous membranes. Thus extensive burns are sometimes observed to be followed by inflammatory attacks in the cerebral membranes, the *pleura*, or the *peritoneum*.

5. Pregnancy, in the case of females, must be allowed to be a predisposing cause of no slight influence. Though peritoneal inflammation takes place most frequently after parturition, and is therefore generally regarded as a puerperal disease, it occasionally occurs previous to parturition, and the disposition to it must therefore be regarded as created by the state of pregnancy. The great distension which the uterine peritoneum undergoes in the latter stage of pregnancy, and the pressure which the gravid womb necessarily makes on a large proportion of the peritoneal surface, are circumstances which cannot fail to have considerable influence on the circulation and secretion of the membrane, and may thereby create the disposition to inflammation. The vessels of the peritoneum may be enfeebled, and thrown into that state which is favourable to the development of inflammation.

B. Among exciting causes, the first and most important is external violence; and though the effect of this cause is seen in the serous membranes of all the cavities, it is most clearly evinced in those of the brain. Thus the most common and uniform effect of a blow on the head, or any species of violence inflicted on it is, after the first symptoms of concussion are over, the superinduction of symptoms of inflammation of the membranes of the brain; and we have in this case the connection between the cause and the subsequent effects clearly established in the fact, that in fatal cases of injury of the head, there are almost invariably effusion of serous fluid in the sub-arachnoid tissue, sometimes lymph in the arachnoid membrane, and more or less serous fluid within the cavity of the ventricles, manifestly effused from the intra-cerebral membrane, viz. the choroid plexus. Water in the brain may often be traced to the circumstance of a blow or fall on the head.

The same influence of external violence in the production

of inflammation is seen in the case of the *pleura*, *peritoneum*, and vaginal tunic of the testicle. A bruise on the ribs, or other violence, I have seen followed by pleurisy; a kick on the belly, or on the testicle, in like manner, is often followed by *peritonitis* and swelled testicle, terminating in hydrocele.

The application of cold in any form is another exciting cause of serous inflammation; and whether it be applied as simple cold, as in the case of the imperfectly clothed, or as cold and moisture, as in cases of thorough wetting, the effect is the same. A wet bandage applied round the belly I have known to be followed by peritoneal inflammation; and lying in damp beds, or on the ground, as in the case of soldiers, is a common mode of the production of pleurisy, or *peritonitis*, or both. It is to be observed, however, that cold and moisture are more efficient in the production of pleuritic or peritoneal inflammation than in that of meningeal inflammation.

Insolation or exposure to the intense beams of the solar heat is, on the other hand, a much more common cause of meningeal inflammation.

Perforation of the serous membrane, whether accidentally, intentionally, or the consequence of disease, is another exciting cause of inflammation. Thus perforation of the lung in cases of wound, or in cases of *vomica* bursting into the *pleura*, is a common cause of pleurisy; and perforation of the *peritoneum*, either by wound, or by ulceration of the mucous membrane, is a cause of peritoneal inflammation. In this species of accident, several causes concur to produce inflammation. Thus, not only the nature of the wound, whether punctured or lacerated, but the circumstance of the entrance of air, and other foreign bodies, has a powerful influence in determining the violence and extent of the inflammation. In the case of ulcerative perforation of the intestine, it is chiefly the escape of the gaseous, liquid, and solid contents of the bowel into the peritoneal cavity that induces the intense and fatal inflammation which almost invariably succeeds that accident.

IV. IRRITATION OF THE SEROUS MEMBRANES.—Before quitting the subject of inflammation of the serous membranes, it may be proper to bestow some reflections on that of irritation taking place in these membranes. I have already said in speaking of irritation of the mucous membranes, that the term is often em-

ployed in a sense much too vague, and without having attached to it any very definite idea. This remark is not less applicable to the subject of irritation in the serous membranes, in which perhaps it has received still a smaller proportion of accurate consideration; and, indeed, if we observe the ordinary language of physicians and surgeons, we shall find that they very often speak of irritation and symptoms of irritation without referring the state to any particular tissue. It is requisite therefore to consider whether there be any facts, and what these facts are, which entitle the pathologist to infer that in the serous membranes such a condition exists as that of irritation as distinct from inflammation.

I already attempted to show that the state denominated irritation taking place in the mucous membranes, is indicated chiefly by a considerable change in the natural sensibilities of these membranes, and thereby in the sensibilities and functions of the organs which they envelope. The most usual change in these sensibilities consists in the development of tenderness or pain, more or less acute, and more or less enduring, sometimes with slight, sometimes with considerable change in the circulation and the secretions of the membrane, yet without producing those changes in structure, or those morbid products by which the process of inflammation is distinguished. In a certain class of cases, even without any change in sensibility in the membrane or indication of pain, there arise symptoms which are referred to the state of irritation, because, though these symptoms indicate the presence of a morbid state, it is impossible to refer that morbid state to the head of inflammation.

The membranes in which these phenomena are best exemplified are the arachnoid and the *pia mater*, both of the brain and of the spinal chord. In certain states of the system, especially in *hysteria*, in epilepsy, in chorea, in *delirium tremens*, in the incipient stage of the meningeal disease which terminates in water in the brain, in the incipient stage of mania, in hydrophobia, and perhaps in tetanus, various symptoms take place in the sensations, in the muscular motions, in the intellectual functions, and even in the circulation of the skin and mucous surfaces, which cannot with perfect justice be ascribed to the presence of inflammation, and which are therefore conceived to depend on a state of congestion of the capillary vessels of these membranes. The chief reasons for this opinion may be stated in the following manner.

1. In various forms of *hysteria*, acute and chronic, the patient is for a time delirious, convulsed, and even insensible to external impressions, and unconscious of her own thoughts, words, and actions; yet, in the course of a few hours, in other instances of a day or two, becomes quite rational in thought, word, and speech, has complete command over the voluntary muscles, and is in all respects in the apparent enjoyment of health, without any indication of derangement in the functions of the brain or its membranes. It is manifest that no serious lesion in either of these tissues could have been inflicted, otherwise death must have taken place. It is also manifest that no morbid product could have been formed, otherwise the functions performed by the brain must have been more or less impaired, perverted, or destroyed. But it is not less manifest that the state of these tissues, especially that of the membranes, could not have been natural, or, as it may be styled, normal during the persistence of the symptoms now specified, otherwise these symptoms could not have ensued. It is also not less manifest that these symptoms could not have depended on inflammation, otherwise they could not have so readily disappeared without causing morbid products. It may be hence inferred, that the only state adequate to produce these symptoms is that of an injected or temporary state of congestion of the vessels, which then acts as a source of irritation to the membranes and to the brain.

2. In epileptiform convulsions, the same form and train of symptoms take place, may continue for months or years, and may at length, under the use of proper remedies, or sometimes without remedies, disappear entirely. In cases of this kind, it is impossible to suppose that any serious change had taken place, either in the membranes or in the brain; and we can merely infer, that the symptoms observed depended upon the occasional irritation induced by temporary congestion of the meningeal vessels.

3. In cases of the dance of St Vitus, the muscular motions continue so unsteady for days and weeks, or even months, that the individual possesses no command over the muscles of the extremities, sometimes none over those of the face and head; and yet, after a certain time, under the use of proper remedies, the motions gradually cease, and the individual recovers the wonted control over his muscles, and executes all the motions with steadiness and precision. It cannot be admitted that in

such cases, any state of the vessels capable of producing permanent lesion or morbid change in the brain, the spinal chord, or their membranes, had taken place. Yet we know that in cases of St Vitus's dance, which terminate in fatuity, palsy, epilepsy, or death, various lesions, the effect of acute or chronic inflammation of the membranes, are found. We are therefore reduced to the alternative of supposing, that some state of the vessels, short of the inflammatory, and not necessarily inducing morbid products, had been the cause of the symptoms of chorea, or that an inflammatory state of the membranes of the brain and spinal chord could continue for some time, and subside without proceeding to the formation of morbid products. Though the latter alternative is not impossible, it is greatly less probable than the former; and hence it may be inferred, that in this class of cases of chorea, the symptoms arise chiefly from irritation of the nervous centres by congestion of the cerebral and spinal *meninges*.

4. These principles are perhaps more forcibly illustrated in the phenomena of the disease denominated *delirium tremens*; in which we shall have occasion to see, that the incipient stage must be one chiefly of irritation in the cerebral membranes, or rather irritation of the cerebral substance from previous injection of its membranes; and also in the meningeal disease which terminates in water in the brain.

5. With regard to tetanus, whatever be the remote cause of that disease, whether wound or exposure to cold, or both, there is strong reason to believe that most of the phenomena depend upon irritation, propagated from the nerves to the spinal chord, or rather to its investing membranes, and there giving rise to the irregular and violent involuntary motions and spasms. Neither in the inspection of the bodies of those cut off by this disease, nor by hydrophobia, do we invariably find traces of inflammation, or inflammatory products; yet in both these diseases many of the symptoms indicate an intense degree of disorder of the nervous system. It seems most consistent with the usual and general facts of morbid action to believe, that this disorder consists chiefly in a state of irritation or undue excitement of the brain and spinal chord, in consequence of injection of the vessels of the membranes, undue distension of these vessels, and perhaps a state of the blood in them not sufficiently changed by perfect circulation in the lungs,

In proof of the reality and influence of the cause last specified, many facts might be adduced. It is sufficient to mention, that in most cases of asphyxia, where the asphyxiating cause operates quickly in loading the nervous system with modena or unrespired blood, convulsive motions are observed to accompany the loss of sensation and consciousness. As illustrating the same point, I may refer to the history of the convulsive and delirious symptoms which affected the girls of the parish of St James', in King Street, Golden Square, in 1782, as described by Sir George Baker in 1784, and in which these symptoms, with vomiting and pain in the site of the stomach, could be referred to no other cause save that of respiration of air contaminated by being too long respired, and employed to maintain the combustion of candles without being duly changed.*

It is not necessary to imagine that this state of the cerebral membranes is newly discovered. Such a state has been noticed, though not very distinctly described, by many authors, but especially those who have treated of water in the brain, by those who have treated of verminose diseases and their effects, and, more recently, by Dr Whitlock Nicholl, and M. Piorry, under the name of cerebral irritation. It is chiefly, however, in the brain and spinal marrow that the phenomena of irritation have attracted attention; and this circumstance, perhaps, has diverted the observation of pathologists from the true source of the morbid phenomena referred to this head.

In considering the nature of irritation, attention should be directed to three circumstances; 1st, the phenomena of irritation; 2d, the tissue, organ, or parts in which these phenomena take place; and, 3d, the irritating agent, or cause or causes.

Nothing is more difficult than to define or describe the phenomena of irritation in the serous membranes; for the very phenomena which one physician is inclined to refer to irritation in these membranes, another imputes to irritation in some adjoining tissue,—to a morbid process altogether different, or even to congestion, and inflammation.

Mere tenderness or pain in the site of these membranes, for instance in the head, chest, or belly, cannot be allowed in all instances to be a phenomenon or proof of the presence of irritation; for in various instances in which certain morbid ac-

* An Account of a singular Disease which prevailed, &c., by Sir George Baker, Bart. Medical Transactions, Vol. iii. p. 113, Art. xi. London, 1785.

tions or phenomena take place, which subsequent observation shows to have proceeded from an irritated state of these membranes, no tenderness, morbid sensibility, or pain, was known to take place. Thus, in cases in which hysterical symptoms appear, or in which tetanic motions ensue, and in which we know that some temporary irritation of the cerebral or spinal serous membranes must have existed, no pain was felt, or it was felt only after the hysterical or tetanic symptoms disappeared. Conversely, it must be admitted, that in many instances of hysterical and other nervous symptoms, pain of a very acute kind occurs, and indicates the existence of irritation alone. Thus in certain forms of *hemicrania*, the pain seems to be referable to a state of the cerebral membranes, in which the vessels are loaded, distended, and stretched by a quantity of blood, perhaps not perfectly arterialized, and the presence of which acts as an irritant, mechanical in quantity, chemical in quality, and physiological or vital in both respects. In other instances of the same disorder, the pain, which is also very acute, seems to depend upon some disorder of the stomach or intestinal tube; and this inference is rendered manifest, from the fact, that, under the use of purgatives, very speedy relief is obtained. In this instance, however, the source of the irritation is seated in the alimentary canal, while the process of irritation takes place in the cerebral membranes or in the brain. To determine the medium of operation is the difficult point. This some have referred to the sympathetic consent believed to exist between the brain and cerebral membranes on the one hand, and the stomach on the other; and which is believed further to be maintained by the intimate union between the fifth and sixth pairs of nerves. It is believed that in such circumstances the irritation applied to the ramified extremities of the splanchnic nerves (great sympathetic) is propagated backwards to their spinal and cerebral connections, and may by the latter, through the medium of the Vidian nerve, affect the fifth pair and the cerebral membranes at its origin.

But, whatever be the medium of communication, it is important to know, that it may be regarded as a principle in pathology, established by the conjoined evidence of many facts, that various morbid states of the alimentary canal, or of the gastro-enteric mucous membrane rather, may and do give rise to symptoms of irritation in the cerebral membranes, indicated

by pain in various parts of the head, tenderness and pain of the scalp, unusual contraction or dilatation of the pupils, transitory insensibility, with spasmodic or convulsive motions of the face and upper extremities, and sometimes incoherence in language, hallucinations, and spectral illusions.

On the nature and essence of this irritation we have no positive facts. It is not improbable that it consists in some temporarily congested or overloaded state of the vessels of the membranes. That it is temporary, may be inferred from the fact, that all the symptoms disappear as the original source of irritation in the alimentary canal is removed, by the prompt administration of energetic cathartics. That it is attended with, if not dependent upon, an injected, congested, or overloaded state of the vessels is probable, if not certain, from the circumstance, that it is difficult to imagine such symptoms to take place without some change in the circulation of these membranes.

Lastly, that the vascular system and circulation of the membranes is chiefly the seat of this state, is, I think, manifest from the following anatomico-pathological facts. 1. The substance of the brain itself is supplied with blood-vessels and blood solely from the membranes, which support, convey, and subdivide the whole of these vessels previous to their final entrance into the cerebral substance. 2. Though presenting, therefore, a distinct, definite, and peculiar structure, the brain itself cannot be said to be highly organized, or possessed of those peculiar properties as a vascular organ, which enable it to be primarily influenced by changes in the state of the circulation. 3. When changes take place in the vascular part of the brain, they are not so easily and rapidly restored as when they take place in that of the membranes, and they lead to morbid products which are incompatible with the functions of the organ and the continuance of life. 4. When much injection takes place in the cerebral membranes, and becomes a fixed and permanent morbid state, it gives rise to extravascular effusion, not only in the subarachnoid filamentous tissue, but through the whole substance of the brain, constituting *œdema*, or rather serous infiltration, of that organ, (*œdema cerebri*.)

In this instance the train of morbid phenomena may be represented in the following manner. *First*, the primary agent of irritation is seated in the alimentary canal, in its villous

membrane or its blood-vessels. *Secondly*, the morbid state of this part of the system induces congestion or injection, or accumulation in the vascular system of the serous membrane of the brain and spinal chord. *Thirdly*, this congested or overloaded state of the meningeal vascular system acts as an irritant, not only to these membranes, but to the brain, *cerebellum*, and spinal chord themselves, giving rise to various derangements in the functions of these textures.

In all instances it may be considered as an established law in pathology, that irritation, if not promptly allayed by removing its causes, or preventing their operation, will proceed to cause various changes in the functions of the membrane or organ in which its effects are most intensely displayed, and may, either by the induction of inflammation, or some of its morbid effects, or by itself, impair or totally destroy the functions of the organ.

Irritation may be of short or temporary duration, or lasting and enduring. It may be also periodical or recurrent, that is, its phenomena may intermit and subside for a time, and then return. Temporary irritation of the cerebral serous membranes is most usually seen in infants and children, in consequence of various disorders affecting the alimentary canal, such as dentition, indigestion, the presence of worms, constipation, diarrhœa, or rather the states of the intestinal villous membrane causing these. It is also an effect of eating various poisonous articles, especially the poisonous fungi. Enduring irritation is seen in such disorders as chorea, epilepsy, and various forms of mental derangement.

Of periodical, recurrent, or intermittent irritation, the best examples are found in the case of agues with symptoms of disorder of the brain, as the various phrenitic agues, the soporose, comatose, cataleptic, apoplectic, and hysteric or tetanic tertians, and the whole of that tribe of agues which in warm climates commence, or are attended with intense headach and delirium, and terminate in *sopor*, *coma*, or maniacal attacks.

A form of irritation, sometimes sudden in its approach, sometimes slow and gradual, and affecting the cerebral with the other serous membranes, is seen in the gray and granular degeneration of the kidney. In one gentleman the first indications of this state were convulsive fits, which were relieved by blood-letting and the employment of cathartics. The symp-

toms were averted for some time; but a state of drowsiness mixed with restlessness, came on and passed into stupor and fatal coma. The most usual mode in which this form of meningeal irritation approaches, however, is by the appearance of drowsiness and stupor approaching slowly but steadily, and proceeding to insensibility and coma.

Of irritation in the *pleura*, *pericardium*, and *peritoneum*, the phenomena do not attract so much attention, or at least they are liable to be more easily confounded with the phenomena of inflammation and congestion.

The most general cause of irritation in all these membranes is the existence of the renal disease now mentioned, and the existence of various disorders of the liver, in which bile is imperfectly or scantily secreted. It appears as if in consequence of the hebetude of the glandular system, and its incapacity to eliminate from the economy various elements which in the healthy state are eliminated, the presence of these elements in the vascular system acts as a source of irritation to all the organs, but more especially to the serous membranes. It is observed, that, in the case of renal disease, the quantity of urea excreted is diminished, and in that of hepatic disorder, the quantity of bile, and picromel and cholesterine excreted are diminished; and it is reasonable to infer that the presence of these substances or of their elements in undue quantity must be a source of irritation or pernicious action.

The presence of tumours or morbid growths, either in the serous membranes or the organs which they invest, is a frequent source of irritative phenomena in these membranes. Thus miliary tubercles may be formed in the *pleura* or *peritoneum*, or at their free surfaces; or encephaloid tumours may be formed in these membranes, and may prove a source of irritation so as to increase abnormally their natural secretion. In the body of a man who was labouring under extreme difficulty of breathing, amounting to *orthopnoea*, with a bloated livid countenance and much swelling of the right arm, and who had been affected with urgent cough for eight years, I found in the *pleura* and *pericardium* encephaloid tumours, varying in size from the bulk of a garden pea to that of a filbert, besides a considerable mass of the same substance embracing the large vessels and windpipe, and compressing the right subclavian vein. In this case these tumours had irritated both

membranes so much as to cause within their cavity the effusion of a considerable quantity of serous fluid. Ossification or cartilaginous degeneration of the *pleura* or *pericardium* also operates on these membranes as an irritating agent. In the same manner the *peritoneum* is liable to be affected by the growth of numerous, minute, hard, cartilage-like grains or tubercles, which then act as irritants. I have elsewhere described a case in which the whole intestinal *peritoneum* was extensively occupied by minute hard granules of this kind, and in which their presence had given rise to the secretion of a considerable collection of serous fluid within the *peritoneum*.

Tumours, tubercles, and various morbid changes in the contiguous tissues may also induce irritation in the serous membranes. Thus tumours in the brain or skull cause meningeal irritation; tubercles or induration of the lungs cause irritation in the *pleuræ*; tumours of the liver, spleen, pancreas, or of the stomach or intestines cause irritation, and not unfrequently inflammation in the *peritoneum*; and even all the morbid changes in the gastric and intestinal tissues, whether affecting the villous, or the muscular, or all the tunics, give rise to symptoms of irritation in the same membrane.

The phenomena of irritation are not marked in these circumstances by very conspicuous signs. Instead of pain, either acute or long-continued, it is more common to observe transitory feelings of uneasiness, or sometimes merely shooting pains of the most temporary character, sometimes an indescribable feeling of uneasiness and discomfort, referred to the chest or some part of the body respectively. After some time, however, when the irritating agents have begun to affect the circulation, nutrition and secretion of these membranes, a new train of symptoms appears. The functions of the organ or organs covered by the membrane are more or less, sometimes very much deranged; a dingy sallow hue of the countenance appears; the flesh is wasted, the strength is impaired, and the night is spent without sleep or with short feverish unrefreshing slumber; and all the indications of general disorder of the health are manifest. When the irritation is in the *pleura* the respiration becomes short, panting, orthopnoic and laborious, with cough and paleness or lividity of the countenance. When it is seated in the *peritoneum*, dyspeptic symptoms with great emaciation take place. Sometimes vomiting comes on

and continues to the close of life, which is seldom very distant. In other cases diarrhœa and constipation are alternate symptoms.

Lastly, inflammation itself, and any of the morbid products which it forms, may act as irritants, and induce in the serous membranes all the phenomena of irritation already noticed. Hence, while irritation of these membranes may give rise to inflammation, universally the latter process, if not subdued, gives rise to symptoms of irritation.

The phenomena of irritation thus manifested in the serous membranes cannot be ascribed to the influence of the irritant agent or agents on their nerves, or to the reaction of their nervous system upon these agents. It is an anatomical fact, that in these membranes no nervous twigs or filaments have yet been detected by the most careful anatomical observation. Thus, though the intercostal nerves are observed beneath the costal *pleura* to accompany the intercostal artery and vein, they are not known to send any filaments into the costal *pleura*. The phrenic nerve is not known to send any of its filaments either to the pulmonic or the diaphragmatic *pleura* or to the *pericardium*, which is further not known to receive any filaments from the cardiac nerves. These nervous branches proceed to the muscular fibres of the diaphragm and heart respectively. In the abdomen, in like manner, the branches and filaments of the splanchnic nerves are sent entirely to the villous membrane, and in a small proportion to the muscular tissue; and no perceptible filaments are known to enter the *peritoneum*.

It must be inferred, therefore, that, in the present state of knowledge, we are without any facts to show, that this property of becoming the seat of irritation, depends, in the serous membranes, on the presence, extent, or influence of the nervous system. Anatomical facts at present show, indeed, that the serous membranes are in this respect placed altogether without the dominion, as it may be said, of the nervous system; yet they present certain phenomena which must be ascribed to irritation. From these facts and considerations it further results, that the serous membranes possess, as organized tissues, certain properties, which are liable to be deranged or otherwise perverted, and that various agents and states, either of the membranes themselves, or of the adjoining organs, are capable of producing this perversion in properties.

These observations may perhaps illustrate in a general manner the subject of inflammation of the serous membranes. The peculiarities and minuter features of this family of diseases will gradually be developed in the history of the individual inflammations. These are, inflammation of the cerebral serous membrane or arachnoid coat, *meningitis*, *arachnitis*, *phrenitis*, of the pulmonic serous membrane, pleurisy, *pleuritis*, of the cardiac serous membrane, *pericarditis*, of the abdominal serous membrane and its divisions, *peritonitis*, *gastritis*, *enteritis*, *colitis*, of the testicular serous membrane, *orchitis*, and of the articular synovial capsules. In the nomenclature of these diseases we adhere to the usual practice of nosological authors, in adopting the termination *itis*, to denote inflammation of a serous membrane, solely and exclusively for two reasons,—1st, Because there is good evidence that the ancients, and especially the Greek physicians, confined this termination to inflammatory diseases of these membranes exclusively, and never applied it in the indiscriminate manner in which modern authors do to all inflammatory diseases whatever; 2d, Because it is desirable and expedient to employ a characteristic termination to every family of diseases which are thus distinguished by certain common characters.

§. I. *Meningitis*; *Phrenitis*; *Arachnitis*; *Arachnoideitis*; Phrenesie, Pinel; Frenzy; Inflammation of the Cerebral Membranes.

NOSOLOGICAL AND PATHOLOGICAL CHARACTERS.—Vogel remarked that the symptoms of frenzy (*Phrenismus*,) or inflammation of the brain or its membranes, were very ambiguous. Cullen admitted the truth of this remark, stated his own opinion, that there were no symptoms by which inflammation of the brain could be uniformly distinguished from inflammation of its membranes, and expressed his conviction that the distinctions delivered by Sauvages, Linnæus, and Sagar, between inflammation of the brain (*Cephalitis*; *Sphacelismus*,) and of its membranes, were not confirmed by dissection. He therefore, he informs us, referred both varieties of inflammation to the same generic head. These views are partly founded in truth; and it is not without reason that Pinel, after admitting the difficulty which is encountered in distinguishing, by mere symptoms, inflammation of the membranes from that of the brain, has recourse to the less equivocal plan of tracing these symptoms

from the history of cases, in which inflammation of the membranes had evidently succeeded external violence.

But if the nosologist must have recourse to this mode of inquiry, in order to furnish proper evidence for his distinctions, and I think that it is the most satisfactory in the existing circumstances, I have also to remark that, as there are numerous cases recorded in the writings of authors in which dissection disclosed the traces, or at least the effects of inflammation in the cerebral membranes, there can be no rational objection to the employment of such cases for the same purpose. When the subject is viewed in this light, the question of the remote cause, and the distinction of meningeal inflammation into idiopathic and symptomatic, comes to be a matter of indifference. It may be said that almost all inflammatory diseases have their appropriate remote causes, and that, as the presence of foreign bodies cause inflammation of the eyes, exposure to cold, inflammation of the chest or belly, as a slight blow, a fall, or exposure to the vivid rays of a tropical sun may induce inflammation of the cerebral membranes. The greatest objection to the plan which Pinel has followed is, that violence applied to the head may cause inflammation not only of the *pia mater* and arachnoid or proper cerebral membranes, but of the *dura mater* also, and thus create a source of doubt. From this objection the method of which I speak is entirely free, and it only requires that the symptoms should be in every suspected case carefully remarked during life, and the appearances carefully examined after death.

Joseph Frank and Hildenbrand take a different view of this subject. Proceeding on the principle, that it is impossible to distinguish between inflammation of the brain and that of its membranous investments, these authors refer to the general head of *encephalitis* or *enkephalitis*, inflammation both of the brain and that of the membranes. This difficulty I do not deny; and it receives strong confirmation, not only from the intimate vascular connection between the brain and its membranes, but also from the morbid effects of congestion or inflammation of the latter, in which the brain is always minutely traversed by red streaks and points, and its substance is more or less abundantly infiltrated with serous fluid. But when I find Joseph Frank referring to this head ordinary *meningitis*

under the name of *Encephalitis phrenitica*,* and Hildenbrand evading, but not removing the difficulty, and even committing some inconsistency by saying, that in *encephalitis*, the membranes present most frequently, and the cerebral substance very rarely, traces of inflammation,† I think every thing concurs to show, that, both in a semiographic and pathological view, we must admit the existence of a disease, in which the prominent and essential symptoms consist in congestion, injection, or inflammation of the cerebral membranes. Of another division admitted by Joseph Frank, I must confess my inability to see the advantage. Traumatic, inflammatory, and secondary *encephalitis* must be altogether the same disease, whatever be the remote cause; the periodic is either that symptomatic of ague, or of certain forms of *meningitis*. Of the rheumatic and gouty I shall speak in its proper place. The typhoid is that which takes place occasionally in typhous fever. I may further remark, that I think the subsequent observations will show that the cerebral substance itself, though by no means exempt from the inflammatory action, is nevertheless the seat of this action, chiefly in consequence of the perverted action of the vessels of the *pia mater* and arachnoid membrane, and that, on the application of the same causes, inflammation of the membranes is in general the first and most prominent morbid action.

The first point in this inquiry is to determine the appearances of the arachnoid and soft or vascular membrane which constitute inflammation, or which demonstrate its effects. Are we to expect great vascularity of the arachnoid, or opacity, thickening, or loss of lustre? Are we to expect the vascular

* “*Encephalitis dicitur inflammatio cerebri, cerebelli, medullæ oblongatæ, meningum, febre, sæpe hypochondrii dextri tensione et vomitu, ac pro re nata capitis dolore, delirio, sopore, tremoribus insignita.*” Præleos Med. Universæ Prinept. Partis Secundæ, Vol. i. Sect. i. Cap. iii. p. 241. Taurini, 1821.

“Porro pro re nata, summa cephalæa, delirium, sopor, vel tremores morbo peculiarem formam impertiunt, cui formarum diversitati divisio nostra encephalitis in *cephalalgicam, phreniticam, lethargicam et tremefucientem* innititur.”—Ibid. p. 246.

† Communissimum phlogoseos substratum sistit pia meninx, omnium vasculossima, et arachnoidea, quæ serosum exhalans vaporem, irrorandis cerebri meandris et involucris est destinata. Pulpa e contrario, præsertim interior, non minus ac dura mater inflammari cunctatur, nisi violentiores concurrant potentiæ. Ignota vero hodiedum, aut saltem obscura, quæ meningum phlogosin (*meningitidem*) ab illa medullæ cerebialis distinguere permetterent, phenomena singuli substrati affectus seorsim pertractare velant. Hildenbrand, Institutiones Practico-Medicæ, Tom. iii. p. 55. Viennæ, 1822.

membrane (*pia mater*) to be more vascular, to become thickened, or to be rendered entirely opaque? In collecting evidence to answer these questions, it is indispensable to keep in mind the anatomical relations of the *pia mater* and arachnoid membrane; and to remember,—that, pathologically speaking, the cerebral membrane, which at its inner, attached, or cerebral surface, is a net of blood-vessels, vascular filaments, and cellular tissue, is at its outer or free surface, a serous membrane,—the arachnoid of the ancient anatomists. Of this inner or vascular part, Baillie has justly remarked, that it is more difficult to distinguish the inflamed condition, than of any other membrane in the human body, in consequence of the numerous vessels which are distributed through it. He might have added, that, in consequence of the mode in which death usually takes place after disease in the human subject, these vessels are distended with an unusual quantity of dark-coloured blood, and thus present another source of fallacy. He has, however, stated, that, in the inflamed state, the small vessels of the membrane become more numerous than in the natural state, are filled with *florid* blood, and form by anastomosis a beautiful net-work. In other words, the practised eye readily distinguishes the large vessels of the vascular membrane from its transparent spots or intervals, and will not fail to remark, that these intervals become vascular during the process of inflammation. It rarely happens, however, that these spaces become so uniformly red, as to leave none of the membrane in its natural state. At the same time, the processes which enter the furrows of the convoluted surface become more vascular than usual, and are said to adhere more firmly to the substance of the brain.

Vascularity of the arachnoid is on the contrary rare; and this membrane seems to be as free from red blood-vessels in the diseased as in the healthy state. It may become thicker than natural, so as to form a tolerably firm membrane, and after red it lose its lustre and transparency. These changes I ascribe to the process of inflammation, though no lymph nor purulent exudation is formed. They may be regarded as marking the first, or incipient stage of the process, which eventually, if life be not extinguished, may terminate in albuminous or purulent secretion.

On the presence of coagulable lymph, purulent effusion, ad-

hesion, patches of ulceration, or the morbid changes which take place in other membranes in consequence of this process, pathological testimony varies. Baillie states that the effusion of lymph from the inner surface of the *dura mater*, or its arachnoid portion, though uncommon, sometimes occurs, and that adhesions, though also rare, have been observed. Similar effusions of lymph are mentioned by Tacheron in his 7th and 9th cases. It cannot, indeed, be doubted that albuminous exudation is rare in the arachnoid membrane, whatever be the cause; and that in this respect it differs somewhat from the other serous surfaces. "It very rarely happens," says Baillie, "that any layer of coagulable lymph is formed in the inflammation of the *pia mater*, which is so very common in inflammation of the *pleura* and *peritoneum*." It is evident that the author here means the serous or arachnoid surface of the cerebral membrane.

That this substance is actually secreted by the inflamed arachnoid membrane, is proved by the researches of Stark, who records three cases in which lymph was found between the *dura* and *pia mater*, and round the membranous covering of the *medulla oblongata*, and spinal chord.* In the winter of 1818, I found, on examining the brain of a woman who had died after being first delirious with convulsions, and then in a state of deep coma for twelve hours previous to death, a pretty thick layer of coagulable lymph spread over the arachnoid membrane of the base of the brain, from the *chiasma* of the optic nerves backwards, over the pisiform bodies (*corpora albicantia*,) the *crura* of the brain, the intercrural *fossa*, the inferior surface of the annular protuberance, and a small space of the bulb of the chord, and the subarachnoid tissue was rendered tough and firm by the infiltration of sero-albuminous fluid. Similar cases have since been published by Dr Hooper, Dr Bright, Cruveilhier, and Dr Maclagan. A similar example, in which lymph was distinctly deposited over the surface of the arachnoid membrane along each side of the falx, fell under my own observation in the course of the summer of 1836.—(Ed. Med. and Surgical Journal, Vol. xlvii. p. 305.)

Purulent secretion is more common, especially in those forms of inflammation which succeed injury of the head. Morgagni mentions the case of a young woman, who, having been over-

* The works of the late William Stark, M. D., &c. London, 1788. Part iv. p. 69.

heated in travelling, was seized with violent pain of the head and acute fever, yet without delirium,—and in whom, after death, the outer or serous surface of the *pia mater* was found covered with a small quantity of thick inodorous yellowish matter, which was reckoned purulent by the inspectors. Baillie also remarked, that “when the *pia mater* is inflamed to a high degree, *pus* is commonly formed;” and that “he had seen it effused over the whole upper surface of the brain, in consequence of inflammation of the *pia mater*.” Was this “upper surface of the brain” the actual convoluted surface of this organ, or the outer or serous surface of the *pia mater*? As the furrows of the convolutions are not mentioned, it must be presumed that the purulent fluid was in the latter situation. Upon the whole, it must be admitted, that though inflammation of the cerebral membranes may terminate in effusion of lymph and secretion of purulent fluid, it is more common for it to terminate in serous or sero-albuminous effusion, before the effusion of coagulable lymph or purulent fluid has taken place. The chief reason of this seems to consist in the circumstance, that the vascular congestion and the consequent serous effusion are sufficient to impair or even abolish the functions of the brain, and thereby cause the fatal termination, before there have been time, as in other regions of the body, for purulent effusion.

The remarks now made are applicable chiefly to the most acute form of meningeal inflammation. There is another variety of this disease of no unfrequent occurrence in practice, which I would distinguish as subacute or rather chronic, being mild and insidious in character, and slow in progress, and in which the vascular congestion begins, and is established in so slow and gradual a manner, that some time elapses before any morbid product is formed, and that morbid product is chiefly serous fluid effused into the subarachnoid tissue, and within the ventricles, and infiltrated into the substance of the brain. This variety is less frequently fatal, but it is often the pathological cause of certain forms of mental derangement, and tends to terminate in loss of memory and fatuity. A third variety of *meningitis* is observed to take place in the disease named the Brain-Fever of Drunkards, especially when that disease proceeds to the fatal termination. And, lastly, the disease frequently observed in childhood, in early life, to give rise to the symptoms described by physicians, as those indicating water

in the brain, is, whatever it may be in its origin, always in course accompanied with marks of congestion and inflammation of the cerebral membranes. I shall, therefore, in the subsequent history of symptoms, distinguish the disease into four forms, 1st, acute *meningitis*; 2d, subacute or chronic *meningitis*; 3d, the meningeal disorder in the brain-fever of drunkards; and, 4th, the meningeal disorder of water in the brain.

A. *Meningitis Acuta.*

J. C. Brendelii, Dissert. de Phrenitide. Goett. 1756.—Schroeder resp. Fein Diss. sist. de indole et sede Phrenitidis et Paraphrenitidis analecta. Goett. 1765.—Timmermann Diss. de Phrenitide Idiopathica Kiliae. 1778. M. Stoll de Causa et sede Phrenitidis. Rat. Med. Part iii. Sect. iii. Vol. iii. p. 173. Viennae, Austr. 1780.—Fischer, Diss. de Cerebri ejusque membranarum inflammatione et suppuratione occulta. Goett. 1787.—Herpin sur l'Inflammation des Membranes de l'Encephale. Paris, An. xii.—Baurenstein de Encephalitis et Phrenitide Diss. Erlangae, 1812.—Hospital Reports, by Richard Bright, M. D. Vol. ii. Part i. 4to. London, 1831.—Case of Meningitis, by David MacLagan, M. D. &c. Edin. Med. and Surgical Journal, Vol. xlv. p. 342. Edinburgh, 1835.

SEMIOGRAPHY.—Acute meningeal inflammation may come on either suddenly or after the previous appearance of certain symptoms of deranged health, which have been therefore called precursors.

In the former case, the individual is suddenly attacked with shivering and acute pain of the head, generally about the frontal region, which is rapidly followed by furious raving (*delirium ferox*,) in which he seems to lose his sensibility to external or even internal impressions, his recollection and judgment, and is very boisterous, noisy, and unmanageable. The face is flushed, the scalp hot, the eyes injected and sparkling, the features strongly contorted with emotion; the pulse exceedingly rapid, from 120 to 140 or 150, with violent throbbing of the carotid and temporal arteries. The tongue furred, sometimes dry, yet without complaint of thirst; the bowels generally obstinately bound, and insensible to the action of cathartics; and the urine scanty, and sometimes its secretions almost or totally suppressed. These symptoms are succeeded in no long time, occasionally very rapidly, with convulsive motions of the extremities, and generally at the same time the *delirium* gives place to stupor and coma, which, if not removed by suitable means, or subsiding spontaneously, terminates in complete death.

In those cases in which the approach of the disease is less sudden, and its incipient symptoms are less violent, the individual is sleepless and watchful (*agrypnia*,) with cold extremities; cold, dry, harsh skin; and is distressed with feelings of uneasiness or weight about the head, the orbits, and temples; flushing of the cheeks, or sense of motes (*Muscae volitantes*;) and dazzling lights in the eyes (*Marmaryge*;) ringing in the ears, or occasional spectral illusions and imaginary sounds. At the same time, the appetite is impaired, and the patient is indifferent to the sense of hunger and thirst; if he eats, he is liable to be attacked with sickness and vomiting; and the bowels are bound, often with a sense of soreness, pricking, and itching about the anus and within the rectum, as if an attack of piles were approaching. If at this time the pulse be examined, it is found to range from about 80 to 92 or 96, and to be small and oppressed, but easily accelerated, and liable to great variable-ness in the rate of frequency.

The individual soon after complains of intense headach, which is much aggravated by coughing, stooping, or any motion which impedes the free course of the cerebral circulation;—sometimes of a tight band girding the head, a sense of weight or distension in the orbits, and unnatural tenderness of the skin of the head. Light is painful to the eyes, which are red, and sound to the ears; the tongue is covered with a yellow viscid fur, which readily dries; there is general irritability of the whole system; and the patient is restless and uneasy. Sickness is common, and vomiting not unfrequent; while the bowels are obstinately bound, and not easily affected by purgatives; and the urine, whether clear or turbid, is scanty and high-coloured.

As the disease advances, the patient begins to be absent, to lose the command of his thoughts, and to speak incoherently; and though in general the derangement is of a joyous character, it is not unfrequently gloomy and mournful. In the former case, he sings, roars, laughs, and vociferates,—while the flushed cheek, and sparkling but restless and injected eye, give him some resemblance to a wild Bacchanalian. At the same time he is impatient of control or delay, and expects every thing which he orders to be immediately performed. In some instances, the natural disposition is betrayed by wild sallies of wit, and uncontrollable fits of pleasantry. About the fourth or fifth day, sometimes later, the patient begins to seem exhaust-

ed with this unnatural and uninterrupted revelry; his eye becomes dull and muddy; his countenance pale and bloated; and he is less inclined to speak or sing, and seems oppressed with a sense of general languor; and if his sensibility be still left, he complains of weight in the head and giddiness, says he sees objects double, and fancies he beholds hideous spectres or wild beasts approaching and threatening him with destruction. In a few hours, in general, these symptoms are succeeded by stupor at intervals, mixed or alternating with muttering delirium (*typhomania*;) and in general complete coma, with or without convulsive motions, follows, and terminates in death.

This may be regarded as the most exquisite and severe form of the disease. In less intense cases, that is, in cases in which the delirium is less furious, and the restlessness, watchfulness, and sleeplessness less continuous, as there is more room for the employment of remedies, the disease may either spontaneously, or under the use of appropriate means, terminate favourably or in resolution.

When the delirium is of the gloomy character, and the patient is less noisy and outrageous, there is also less sleeplessness, and sometimes the disease more readily undergoes the favourable termination. Too often, however, this looks like a mere remission of the symptoms, and the patient recurs to his former confusion of thought, absence, and general incoherence.

In some instances, the raving betrays itself in the most obscene and blasphemous expressions; and even persons habitually moral and pious are heard in this state to utter the most frightful oaths and imprecations.

The form of meningeal inflammation now described may occur spontaneously in those predisposed, but is more frequently the effect of violence applied to the head, concussion, or insolation. It is also the effect of long-protracted and intense mental application, with little or no sleep, violent mental emotions, the abuse of spirituous liquors and various narcotics, as opium, stramonium, belladonna; and, in some instances, it seems to succeed the sudden disappearance of an habitual discharge or hemorrhage.

In a certain class of cases, the stage of excitement, as indicated by headach, delirium, and restlessness, passes over very rapidly, and gives place to the stage of typhomania, stupor, and coma so complete, that the patient seems to be labouring under an

apoplectic attack. In cases of this class the patient lies motionless and unconscious, in a sort of stertorous sleep, from which he cannot be raised; there is *subsultus tendinum*; or, while one side of the body is convulsed, the other is paralytic; the pupil is at first contracted, but not sensible to the stimulus of light, and is then dilated; the excretions are passed involuntarily and unconsciously; and, after slow, languid, stertorous respiration, and very slow pulse, death ensues.

When the disease terminates neither in recovery nor in apoplectic death, it may terminate in loss of memory, fatuity, or other mental imperfection.

The appearances after death vary according to the form of the disease. If the patient be cut off in the acute stage, the cerebral membranes are more or less, sometimes very highly, injected. Serous fluid is effused beneath the arachnoid membrane, raising it from the *pia mater* in the form of a thin jelly. Serous fluid is also infiltrated into the brain, so as to render the latter œdematous, and within the ventricles. Lymph even may be effused on the surface of the arachnoid, though not necessarily. In those cases, on the other hand, in which the disease has passed into the chronic stage, with loss of memory, impaired judgment, or fatuity, the membranes are generally thickened, the convolutions are flattened and atrophied, a considerable quantity of fluid is contained within the ventricles, and the *septum lucidum* is destroyed, and the *fornix* and *lyra* softened. In one case of this kind, I found the *dura mater* much thickened, much serous fluid in the subarachnoid tissue, the convolutions flattened and atrophied, between two and three ounces of serous fluid within the ventricles, which communicated, in consequence of destruction of the septum, and the *fornix* elevated and softened.

PROGNOSIS.—Meningeal inflammation, whether idiopathic or symptomatic, is attended with a great degree of danger; and unless the symptoms are alleviated or removed before the fourth day, the morbid process may be inferred to continue, and may be apprehended to terminate in some of those changes incompatible with the healthy functions of the brain.

The most favourable symptoms are abatement or cessation of the delirium, a disposition to sleep, the pulse diminishing in frequency, and becoming soft and more full, the bowels being acted on by medicine, and discharging feculent stools; the skin

becoming moist ; and the urine being excreted in reasonable quantity. Unfavourable symptoms are, persistence of the delirium, and its becoming more furious ; constant restlessness and sleeplessness, with violence, *typhomania*, stupor, or coma ; rapid small pulse, with rapid laborious breathing ; or very slow intermitting pulse, with slow languid respiration ; vomiting ; obstinate constipation ; suppression or retention of the urinary secretion ; dry or partially moist skin ; *subsultus tendinum* ; spasmodic motions of the under jaw ; the smoking symptom, or expiration by one angle of the mouth, the other being paralytic ; dilated pupil, or *strabismus* ; convulsions ; tetanic symptoms or deep coma.

The peculiar causes of meningeal inflammation occurring spontaneously, or without external violence, are not well known. It has been supposed that there is in the constitution of the individual something which disposes to the production of the disease ; and it has been therefore said that its formation is favoured by the plethoric or apoplectic habit, indicated by the large head, short neck, and swollen ruddy face ; by the hot bilious habit of body, that is, I presume, a habitually slow and constipated state of the bowels ; the disposition to fits of anger, or mental emotion of any kind ; and, lastly, the immoderate, habitual use of vinous and spirituous liquors.

The disease has been observed to take place in different individuals of the same family ; and while it has been observed to occur in one individual, palsy, or apoplexy, or epileptic symptoms have been known to appear in another. Persons *veneri plus æquo dediti* have been observed to become the subjects of this disorder ; but in such individuals it is difficult to say,—whether the excessive devotion to sensual pleasures is not an indication of a certain degree of meningeal or cerebral disorder, or, at least, of the weakness of judgment and infirmity of purpose which is associated with meningeal or cerebral disorder, or becomes, by enfeebling the system and disposing to cerebral accumulation, a predisposing cause of meningeal disorder.

Among exciting causes may be enumerated, besides blows on the head, long-continued mental application, especially if without sleep, or accompanied with much solicitude ; and the suppression of hemorrhages, as epistaxis or hemorrhoids. In tropical regions and hot seasons of the temperate zone, a cause not uncommon is insolation or exposure to the intense and di-

rect rays of the sun (*siriasis*,) (coup de soleil,) or sun-stroke.

The disease may also take place secondarily, both in ague and in remittent fever, and also in continued fever (*Synochus vel Typhus*). In the former case it is most frequent in miasmatic districts with intense solar heat. In the case of continued fever, a frequent cause of the occurrence of meningeal symptoms is the conveyance of the sick in the hospital waggons, and also the continued exposure to light, sound, and other stimuli. In one instance I saw the disease ensue on sleeping in the fields for three nights in the country.

TREATMENT.—In the treatment of meningeal inflammation, the object is to promote resolution, and to prevent the diseased action from proceeding to the formation of morbid products. The indications may be reduced to three. The *first* is to diminish and remove the vascular orgasm both of the system and of the cerebral membranes. The *second* is to remove all stimuli or physical agents acting as such, or to prevent and counteract their operation. And the *third* is to restore the action of the skin and the mucous surfaces, and the different secretions carried on in them.

For these objects, the antiphlogistic treatment in all its details must be put in active employment. Blood should be drawn from the system at first to as great extent as the powers of the patient will bear; and if it be carried to the production, or at least to the approach of faintness, it will be so much more effectual in moderating the intensity of the symptoms. The quantity drawn at first from an adult may vary from twenty-five to thirty-five or forty ounces; and if this do not produce a decided abatement in the severity of the symptoms, it is requisite to detract from twelve to eighteen ounces more in the course of six or eight hours, according to the violence of the delirium, and the tension of the pulse, and the effect of the previous evacuation.

It has been supposed that in the treatment of meningeal inflammation, the evacuation now mentioned would be most effectual, if drawn from parts as near the inflamed membranes as possible; and with this view it has been much recommended to bleed from the jugular vein and the temporal artery. From the free communication of the vascular system, this idea seems rather fanciful than real; yet in cases in which the jugular vein can be dexterously opened, and made to bleed freely, the

venesection from that vessel may be equally beneficial with a larger one from the arm. The chief objection to the temporal arteriotomy is the circumstance that it is not in all cases possible to procure from it a sufficient current of blood in so short a time as to produce a strong physiological impression on the circulation; and in some cases, the wound is liable to break out and bleed when depletion is no longer necessary or expedient. Temporal arteriotomy, however, may be used as an adjunct to general venesection.

When the general blood-letting has been carried as far as seems prudent, yet some symptoms of the disease continue after its use, it is proper to detract blood by cupping from the occipital or cervical region, or to apply eighteen or twenty leeches to each temple.

In some instances, as in the case of meningeal symptoms after suppression of the menstrual secretion, it is believed that blood-letting from the saphæna vein is most particularly indicated. In most instances it is requisite to conjoin general and local blood-letting.

In all cases it is indispensable to shave the scalp immediately on the first appearance of the symptoms, and apply to it ice, iced-water, snow, or cloths soaked in cold water. The cold affusion has been recommended; but it should never be used unless in the presence of the physician, and its effects should always be carefully observed. If used with violence, or for a long time, it is liable to produce a most painful tearing sensation of the scalp and head, which it is to be feared has occasionally aggravated all the symptoms.

Next to the employment of blood-letting, general and local, and the application of cold to the shaven scalp, the most effectual agents in controlling the intensity, and checking the progress, of meningeal inflammation, are cathartics. In all cases of this disease, either in consequence of sickness and vomiting, or the inert and torpid state of the bowels, cathartics are either rejected, or do not in the ordinary doses operate readily; and it is only after the great intensity of the disease is enfeebled by blood-letting more or less copious that these remedies can be employed. As soon as their exhibition is practicable, a dose of from six to ten grains of calomel, and sixteen to one scruple of jalap, should be administered, and followed by four or six ounces of the saline infusion of senna. If these be not retained, *enemata*, containing the saline infusion of senna, with

two ounces of castor oil, or oil of turpentine, should be administered. When by the use of these means the bowels have been once or twice moved, it is of the utmost consequence to administer cathartics by the mouth, and either calomel with colocynth or jalap powder, or calomel with two or three drops of croton oil, or the saline infusion of senna should be given in doses, repeated according to their effects on the intestinal tube, and the symptoms of the disease.

It has been supposed, that, in the treatment of meningeal inflammation, the most drastic cathartics, as scammony, elaterium, and hellebore, were pre-eminently indicated. These agents may be requisite after the excrementitious contents of the intestinal tube have been evacuated by milder laxatives; but in the early stage of the disease, and previous to the efficient operation of eccoprotics, they are, with much griping, rather ineffective, and should only be administered after the operation of the latter, and while the *delirium* and flushing of the face or injection of the eye continue.

When it is determined to employ these drastic cathartics, it is most judicious to combine them with others of more gentle and steady operation. Thus scammony or elaterium may be combined with aloes or rhubarb, and hellebore may be associated with sulphur or even manna.

With the view of abstracting all *stimuli*, and counteracting their operation, especially those of light and sound, the patient should be placed in a quiet secluded chamber, moderately darkened; and in order to diminish the tendency to vascular congestion within the head, it is desirable to elevate the upper part of the bed slightly, so as to render it an inclined plane. With the same view, it is often highly important to immerse the lower extremities in warm water, or to foment them with cloths wrung out of hot water.

Besides the revellent influence of blood-letting and cathartics, it is often beneficial to employ those of blisters and sinapisms, the counter-irritant effect of which is believed to diminish the intensity of the internal congestion. Most English physicians apply blisters to the scalp, especially the occipital or cervical region; while several foreign physicians are partial rather to their application to the inner surface of the thighs, and other parts of the cutaneous surface remote from the seat of the disorder; and, in several circumstances, the vesication

which they thus produce is followed by considerable alleviation in the intensity of the symptoms. Sinapisms are always, in this disease, most conveniently applied to the extremities; and, in general, the calves of the legs is a good situation for their physiological action. In some violent cases, more especially with profound stupor, it is desirable to vesicate the skin of the extremities by the sudden application of hot steam or boiling water.

The restoration of the different secretions is of great moment in the treatment of meningeal inflammation. Those of the liver and intestinal mucous membrane will be re-established and maintained by the use of efficient cathartic medicines. For restoring the cutaneous secretion, which is not less important, certainly the most powerful means will be found in the use of general blood-letting, to sufficient extent to subdue the vascular orgasm in the cerebral membranes. But, next to this agent, it is highly beneficial to employ tartarized antimony in nauseating doses. The effect of this substance in allaying the violence of cerebral or meningeal irritation has been long admitted; and it may be given in every case after the use of blood-letting and that of cathartics. Its effect is, in general, to moderate the violence of the delirium, to promote moisture of the skin or slight diarrhœa, and to favour the approach of quiet and sleep. The dose is from one-eighth to one-fourth of a grain, in solution with pure water, every hour or second hour, according to the effects produced. In some instances it has been found good to give two, three, or four grains at once in a small quantity of water; for instance a single ounce, when it produces considerable depression of the strength, sickness, but not vomiting, and at length abatement of the delirium, with diaphoresis.

With the same view opiates may be given, either alone, or combined with antimony or ipecacuan. Several practitioners, indeed, have been apprehensive that opium would be injurious in every form of cerebral or meningeal congestion or inflammation; and the opinion is certainly well-founded as to their exhibition in the early stage of the disease, or when given alone, or before suitable, nay liberal, evacuation from the vascular system. After the violent symptoms of the disorder, however, have been subdued by two or more large blood-lettings, and by the efficient operation of cathartics, and the pa-

tient continues more or less incoherent, restless, and sleepless, with rapid but small pulse, an opiate may be given often with great advantage. There is indeed a state of the system consequent on copious and repeated blood-letting, especially for the removal of inflammatory symptoms either in the head or in the abdomen,—indicated by very quick small pulse, tremulousness, restlessness, and great weakness and irritation, in which a pretty large dose of an opiate acts almost like a charm. It allays irritation and pain, lulls to sleep, and the patient may awaken after eight or ten hours rest, with a pulse reduced from 20 to 30 beats, a moist skin, and a considerable degree of calmness and self-possession. In short, sleep in this state of the system, in whatever manner produced, is a most powerful sedative and antiphlogistic.

With the object now indicated, opium may be given either alone in the dose of from forty to fifty drops of the sedative liquor, or the solution of muriate of morphia, or with ipecacuan or the compound powder (Dover's) in the dose of a scruple for an adult, or with antimony.

Diuretics are of little or no service in the treatment of meningeal inflammation, and upon them it is imprudent to place any reliance.

In various cases of meningeal inflammation, coercion and restraint have been proposed and employed. Restraint either by the strait waistcoat or by other means is a method of treating this disease at once irrational, cruel, and hurtful. In every case in which the patient has so little command over his thoughts and actions as to be dangerous either to himself or others, he should be watched incessantly by a careful nurse; and all mild and gentle means of quieting apprehension and abating restlessness ought to be diligently employed. The strait-waistcoat, mufflers, and all the usual contrivances for personal restraint, invariably aggravate the symptoms, by inducing more resistance on the part of the patient; even opposition and contradiction are not unfrequently hurtful; and unless the pathological cause of the meningeal irritation be removed by the prompt employment of appropriate remedies, the practitioner may rest assured that it will not be removed by means of coercion or restraint. Such measures are employed only to save trouble on the part of the medical attendant and nurses, and I am confident will never be resorted to by those who form a just con-

ception of the true nature of the disease with which they have to contend. The disease must be controlled by means which operate not physically but physiologically.

B. Subacute and Chronic form of Meningeal Inflammation.

This disease I have seen under another form, viz. the chronic; and, as it is one of the modes in which the intellect may be partially or totally deranged, and unless treated with activity and energy, tends to this issue, I shall here describe the disorder, as I have more than once observed its approaches and its symptoms.

The individuals, in whom this disorder is most usually seen, are probably liable to it by predisposition, family characters, or some similar circumstance in their mental and physical constitution. It may take place, and usually ensues, after some considerable mental exertion. Thus a great and unexpected loss or reverse of fortune in men, unrequited affection in females, or disappointment of expectations, not unfrequently groundless, in both sexes, have been all observed to be followed by symptoms which denote the existence of chronic irritation, congestion, and inflammation of the cerebral membranes. At the same time, however, these moral causes are most frequently, I am inclined to say invariably, accompanied with a very unhealthy state of the digestive functions and the whole tract of the intestinal canal,—very generally induced by errors in diet, or excess in the pleasures of the table.

In general the first marked symptoms are sleeplessness (*per-vigilium, agrypnia,*) loss of appetite (*anorexia,*) or indifference to if not disrelish of food, and coldness and dryness of the extremities, especially the feet.

The sleeplessness seems to be partly the result of the individual brooding over his losses, misfortunes, or injuries, real or supposed, partly owing to a degree of mental depression and gloom, which makes him forego all his wonted exercises and pursuits. If he sleep, it is chiefly towards morning, when it is unrefreshing; and interrupted with dreams and gloomy visions, the remembrance of which render the individual still more despondent in his waking hours.

At the same time the individual either loses all relish for food, or tastes it mechanically, and without appearing to enjoy it. The tongue is slightly furred, the bowels are slow and constipated,

and very often difficult to be moved by the largest doses of cathartic medicine. At this time it is not unusual for the patient to complain of pain and sore uneasiness in the anus and within the rectum, as if he were to have an attack of piles, and occasionally a sero-mucous fluid is observed to issue from the anus. A discharge of blood from the rectum may at this time be followed by temporary relief of the painful feelings, and may avert or protract for a few days the further approach of the disease. With or without this hemorrhage, however, the symptoms of uneasiness in the rectum may subside or be so much alleviated as to attract little attention. But in the meanwhile symptoms of a more formidable and decided character appear. The sleeplessness continues; and the patient is restless and agitated. During the day he is absent, and pursues a train of thought peculiar to himself. In some instances the memory is confused or otherwise disordered. At the same time the sickness frequently terminates in vomiting, which usually takes place in the morning, either on rising, or after attempting to take breakfast. In other instances the vomiting appears to follow the kind but injudicious persuasions of friends to induce the patient to take food and drink, and especially if, with the view of raising his spirits, he is induced to take a few glasses of wine, or, what is sometimes also recommended, spirits and water.

When the abdomen is examined the epigastric and umbilical regions are observed to be distended, tumid and slightly sore upon pressure; and in some instances the patient when interrogated complains of a sense of weight and fulness in the epigastric region. In other instances the right hypochondriac region is sore, and the seat of a sense of painful distension; and sometimes both hypochondres are tense and uneasy. In general the umbilical region and the left iliac region emit upon percussion a duller sound than natural; and occasionally this dullness is observed in the right iliac region, and in some parts of the hypomphalic region.

These symptoms are connected with a constipated state of the bowels, especially the distension of the colon and lower end of the *ileum*, with feculent matter, and the congested and overloaded condition of the mesenteric vessels and veins, and perhaps the portal vein.

The respiration is slow, irregular, and occasionally performed with deep sighs.

The pulse varies from 80 to 86, or 90, is rather feeble in its beat, and as if with a peculiar heavy and languid motion of the contents of the arteries. Very generally there is abdominal pulsation.

The skin is cold and dry at the extremities, especially the feet, which continue more or less cold during the whole disorder. When the patient is heated in bed, however, the face becomes flushed, the scalp hot, and partial perspirations break out on the head and neck.

In females the menstrual secretion is either altogether stopped, or recurs at remote intervals, and very scantily.

At length partial or complete confusion in thought, and incoherence in language take place, and the actions of the individual are proportionally irrational and unaccountable. The character of this mental disorder varies in different individuals. Very often it is of a gloomy and depressing nature. The patient is taciturn, shuns society and publicity, is low-spirited, and imagines he has committed some great crime, or at least, that some serious and atrocious crime is to be laid to his charge. In some instances the disorder assumes a religious character, and the individual thinks on all the sins he has ever committed, and firmly believes that they are so great as never to be forgiven, and that he is to be punished in this life and that to come. The mind is not, however, entirely deranged, nor does the individual at all times speak and act incoherently and irrationally. On many subjects he speaks quite correctly, and he is sometimes for an hour or two, or even longer, in a state of comparative enjoyment of reason and judgment. The moment, however, that any of the original subjects of attention are presented to his mind, he again seems to lose the control of his train of thought, and the insane trains recur, sometimes with marks of considerable mental emotion, as wrath, or hatred at certain individuals, and not unfrequently with threats of vengeance. When these subside, the patient relapses into his state of taciturnity, and sometimes quietude, and remains often in a fit of reverie or absence, inattentive to all external transactions or conversation, and is roused only by directly appealing to him, to putting a direct question on some point that strongly interests his feelings. This it is often difficult to do, unless on the points and subjects which have been the original sources of mental agitation.

In some instances the mental derangement depends principally on some hallucination regarding the state of the body of the individual, or it may be accompanied with actual illusions. Thus I had one patient who was firmly convinced that his bowels were entirely obstructed, and that they were not constructed like those of any other human being, nor could be acted on by the same medicines. This person always felt great uneasiness in the umbilical and hypomphalic region; the bowels were obstinately constipated, and the discharges dark-coloured; and his symptoms were invariably alleviated after the use of cathartics. Another was convinced that he had some unusual growth or tumour in the stomach, and only recovered after the largest doses of cathartic medicine had been repeatedly and perseveringly administered. It is in the same disease often that patients imagine that their persons are made of glass or some such fragile material. A particular form of illusion also is sometimes observed to occur. I have seen a patient in this disorder firmly convinced that the figure represented in a portrait was a living being.

It may seem singular, that, with the mental disorder now specified, there should not be headach and other expected symptoms of augmented congestion or impeded circulation within the head. But it must be observed, that, though headach be not uniform, it is occasionally remarked; and in all cases there are various complaints of peculiar and strange sensations in certain regions of the head. In one case or set of cases, headach is felt on any mental effort; on attempting to read or write, and in pursuing certain thoughts. In another class of cases the patients complain of sensations about the ears, or the occipital region, as if the sides or top of the head was going to fly off. And in others there are uneasy sensations of giddiness and weight in the head, with confusion and incapability of moving up and down with confidence. In other instances there are shooting pains and feelings of heat and throbbing in the orbits, in the temporal regions, or in the coronal or occipital regions.

If the disease in this stage be opposed by the prompt and seasonable employment of active antiphlogistic measures to be afterwards specified, all the symptoms may disappear, the patient may recover his usual degree of memory and judgment, and may enjoy his ordinary corporeal health. When, however, the disease is either neglected, or treated as a mere men-

tal disorder, by confinement, restraint, and all the usual physical and mechanical means of controlling those denominated insane, the symptoms may either disappear for a time and afterwards recur, or, under favourable circumstances, may disappear altogether. The latter, however, is a very rare occurrence. When the disease is allowed to proceed unchecked, it is liable to go on to complete and general derangement, to stupor, to palsy, and occasionally terminates in coma, convulsion and death. Most usually after some time, under retirement and abstraction from sources of irritation, slight and temporary amendment takes place. But after intervals, variable in duration in different cases, upon the slightest exposure to any circumstance which agitates the feelings and deranges the digestive organs, all the original symptoms of sleeplessness, *anorexia*, sickness and vomiting, with confusion of thought, incoherence of language, and sometimes great violence and fury in conduct, recur and continue for a longer or shorter period.

These symptoms may now either proceed to stupor, palsy, convulsion, coma, and death, or they may terminate in loss of memory and judgment with fatuity, and sometimes with palsy; and often there ensue epileptic or apoplectic attacks, which may suddenly and unexpectedly terminate existence.

It is rare that we have opportunities of examining the state of the internal organs after death, in the first stage of this disease, after only one attack. But in cases in which either several attacks have taken place, or the disease has continued for some time, the following appearances are found.

MORBID ANATOMY.—The arachnoid membrane is elevated in the form of a jelly-like body, by a quantity more or less considerable of serous fluid effused into its subarachnoid tissue, which also renders the arachnoid, the *pia mater*, and the connecting tissue unusually thick and very generally tough and firm. In various points the arachnoid membrane presents opaque whitish or yellow spots, which appear to be merely parts of the membrane more than usually thickened, with sero-albuminous exudation. In general the *pia mater* is extremely vascular and minutely injected, and its vessels are much distended with dark-coloured blood. From certain parts of the convoluted surface it is detached with unusual facility.

The convolutions of the brain are flattened, especially along the upper regions of the hemispheres, and in some instances they are diminished in size or atrophied by the great quantity

of serous fluid infiltrated into the subarachnoid tissue over them. The ventricles generally contain serous fluid, often in considerable quantity, *i. e.* to half an ounce or six drachms, or even to an ounce or an ounce and a-half. The choroid plexus is highly vascular, and sometimes forms a hydatoid web, in consequence of serous infiltration within its cells. The *fornix* and *septum lucidum* are often softened, the latter broken through. The brain is universally œdematous.

The membranes covering the base of the brain are opaque, thickened, and firm, from infiltration of sero-albuminous fluid. The arteries are occasionally rigid with opaque spots in their tunics.

In some instances in which the disease has been of long duration, portions of the convoluted surface are hardened; and in some they are rough and irregular, with redness and injection.

Among the other organs it is not unusual to find the lungs, the heart, the liver, and the intestinal canal presenting more or fewer marks of disease.

In one instance, in which an individual whom I had seen several times labouring under this disease, died in a fatuous state with convulsions and coma, I found the whole of the lower lobe of the right lung much solidified, firm, and uncrepitating, so that it sunk in water; and the villous membrane of the lower end of the *ileum*, and the beginning of the colon, rough, irregular, and prominent, and slightly abraded.

PATHOLOGICAL NATURE.—The disease, the symptoms of which I have now described, is one of the forms of mental derangement,—very often a variety of monomania; and its sanability depends mainly on the circumstance, whether its progress be checked in the commencement, and therapeutic measures to allay the incipient irritation be seasonably adopted, or be treated in the usual inert mode, as a mere mental disease, by retirement, confinement, and restraint. In the incipient stage, the morbid process is not exactly and strictly inflammatory; but it is irritative and congestive; and, if appropriate means be not employed to allay this irritation, it passes on either progressively, or by repeated returns, to the inflammatory stage, and to the formation of the morbid products discovered after death in fatal cases.

It is also not improbable, that in the very first stage, when the patient is dispirited, thoughtful, solicitous, and sleepless, there is merely an irritative state of the brain from vascular congestion of its membranes; and that this congestion is the

immediate result of the incessant operation of desponding thoughts on the organic part of the brain. It is at least known that intense and long-continued study or any other mental occupation which employs the human mind long without sleep,—and profound grief acting in the same manner,—derange much the powers of the mind, enfeeble the memory and the judgment, subvert their faculty of arrangement and not unfrequently induce temporary delirium. It is remarkable, however, that all these ominous symptoms disappear when the individual begins to sleep; and after two or three nights rest, with relaxation from the causes which originally excited and agitated the mind, the memory and judgment recover their original strength.

It is quite clear that were the membranes inflamed during these symptoms, or at least so much inflamed as to give rise to morbid products, such recovery could not take place. It can scarcely ever be allowed to be such a form or stage of the inflammatory process as could be easily resolved, since the disappearance of the symptoms takes place in these circumstances, either under the use of an opiate, or spontaneously. It seems therefore most reasonable to infer that, in the very first commencement of this disorder, it is merely a state of irritation which gives rise to the symptoms.

This irritation, however, is liable to proceed, and often does proceed, to the state of inflammation; and the great object of the practitioner is either to prevent this, or, if the symptoms show that inflammation has already commenced, to employ means calculated to promote resolution, and prevent the formation of morbid products. It has been singularly unlucky for persons attacked with this disease, that the object now mentioned has been either totally unknown, or entirely overlooked; and that whenever symptoms of mental derangement appeared, confinement, restraint, and all other means of coercion, were employed to operate on the mere symptoms, while the state of the cerebral membranes was entirely disregarded. Both medical practitioners and others have acted on the principle that no corporeal disease existed; that the anatomical state of the brain and its membranes was quite natural, and that the distemper was altogether one of the mind. But in this has there been either correct physiological and pathological knowledge, or a consistent mode of reasoning? Was there ever a case of mental derangement, in which, after some time

at least, no lesion, either dynamic or organic, of the corporeal organs took place? Is there any evidence to show that, in cases of mental derangement, there is not a considerable change in the circulation and nutrition of the membranes, and eventually of the brain? The facts already adduced, in stating the morbid anatomy, show indeed the ultimate effects only of long-continued morbid action; but they also enable us to infer, that this must have been preceded by a state of the vessels of the cerebral membranes, which, by its existence, not only caused the symptoms, but led to the ultimate effects visible after death. Thus all the facts concur in showing that in the early stage of the disease, while the prominent symptoms are delirium, agitation, and sleeplessness, there is a state of simple vascular distension of the membranes, thereby causing irritation to the brain, and deranging its functions; and that, in the subsequent stages, characterized by insensibility or hebetude, *inertia*, stupor, palsy, and fatuity, there is more or less effusion, with thickening of the membranes. They further justify the inference, that, if in the incipient stage of the disease, active means be adopted for abating and controlling the morbid irritation, not only will the subsequent morbid products be prevented from being formed, but the symptoms of impaired memory and judgment, and even fatuity, palsy, and imbecility may be averted.

TREATMENT.—On these considerations and principles, the treatment of this disease is to be regulated in the following manner.

First, general blood-letting should be performed to the extent of twenty, twenty-five, or thirty ounces, if the patient be robust, young, and vigorous; and this it may be requisite to repeat to the extent of fifteen or eighteen ounces, after the interval of twelve or twenty-four hours. The practitioner should not be dissuaded from the use of this remedy by the pulse. I have employed general blood-letting with the best effects in such cases when the pulse did not exceed 90.

The next object is to shave the head, and apply cold to the scalp. It is requisite for some time afterwards to keep it shaved.

Cathartics should be given freely and repeatedly, as in the acute form of the disease.

After full evacuation of the intestinal tube, it is highly important to exhibit minute doses of tartarized antimony.

So long as the patient possesses no control over the train of thought,—so long as he is absent, gloomy, and despondent, it will be requisite to detract blood from the head by cupping,

once a week, once a fortnight, or once in three weeks, according to the symptoms and the effects of the remedies.

In some instances, in the case of females, it is of great importance, when the disease is accompanied with suppression of the menstrual secretion, to apply leeches to the groins, or the *vulva*, every third week, while aloetic laxatives and terebinthinate *enemata* are administered.

In the same class of patients, it is of much benefit to employ for half an hour, twice in the week, the hip-bath (*semicupium*,) impregnated with salt, or with mustard, and to administer other emmenagogue remedies, if to this character any be entitled.

In both sexes, it is of great use to employ the shower-bath, and the warm sea-water-bath.

Lastly, when the acute and urgent symptoms of the disorder have been subdued, or at least mitigated in severity, it contributes essentially to permanent recovery, to employ the mind in some quiet but steady occupation, and to oblige the patient to take regular exercise.

In the treatment of this disorder, the usual method by confinement in dark, gloomy, solitary chambers, in a strait-waistcoat, and other means of coercion, as fetters, muffles, &c. is extremely injurious; and is not only directly detrimental in itself, but as it precludes the employment of the proper medical means calculated to diminish and remove the morbid state of the brain, on which the symptoms depend. Such a method is more likely to convert a sane person into a madman, than restore the power of reason when temporarily subverted; and of its influence in causing idiocy, we have most unquestionable proof, in the cases in which long confinement in the Bastile, and more recently the long confinement in some prisons, has been followed by this result. It becomes the rational physician to pause before he consigns a sickly fellow-creature to such a condition; and if he would not confine in a dark cold cell, or restrain by a strait-waistcoat and manacles, a patient labouring under pleurisy, pericardial, or peritoneal inflammation, there is surely as little reason in subjecting to this treatment a patient labouring under meningeal disorder.

Meningitis phantasmatorphora, Brain-Fever of Drunkards; Brain-Fever of Drunkenness. *Delirium tremens*; Saunders and Sutton. *Dipsomania*, ($\Delta\psi\alpha$ *sitis*, thirst, *Mania furor*, derangement;) Hufeland. *Oinomania*, Broussais and Rayer.

(*Oinos vinum, mania furor*;) *Delirium ebriositatis*, Blake. La Folie des Ivrognes, and *Encephalopathia crapulosa*, Leveillé. *Encephalitis tremefaciens*, Joseph Frank and Valentin Ernest von Hildenbrand. *Mania a temulentia*, Klapp. *Mania a potu*, Snowden and Carter. Methystic Brain-fever (*Μεθυω Ebrius sum.*)

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In 1801, Dr Samuel Burton Pearson, then of Newcastle-upon-Tyne, described in a small tract a particular species of febrile disorder distinguished by much confusion of thought, sometimes with spectral illusions and hallucinations and tremulousness of the hands, which appears to have been not un-

common in Newcastle, and which was known as a peculiar species of delirium by Dr Young and Dr Ramsay of that town. In 1812 Dr Armstrong, then of Sunderland, published a short paper relative to the same disease; and the following year Dr Thomas Sutton gave a very full account, under the name of *Delirium tremens*, of the disease as he had seen it in East Kent, and occasionally in the metropolis, drew a strong line of distinction between it and *phrenitis* or *meningitis*, with which it had been too often confounded, indicated the danger of much evacuation, and recommended large doses of opium as the most certain and successful remedy for the removal of the disorder. In 1816, Dr Armstrong published in his work on Typhous Fever, some judicious observations on the nature and treatment of the disorder, in which, though he allowed the value of opium in many cases, he contended for the necessity and benefit of purgatives and cold affusion, and the occasional use, under certain circumstances, of moderate blood-letting. After this period the disease began to attract attention not only among British practitioners, but in various European countries, and also in America. In Germany cases and observations illustrative of the nature of the disease were published by Behr of Bernburg, Wolff of Warsaw, Heineken and Toepken of Bremen, Berndt of Custrin, Hufeland, and Kriebel of Berlin, Dr Andree of Magdeburg, and Goeden of Berlin, and Siebergundi of Dorsten. In France the disease has been considered by Rayer and Leveillé. And in America, where the field of experience appears to be ample, its nature and treatment have been illustrated by Snowden, Klapp, Staughton, Stephen Brown, Coates, Wright, Carter, Jackson, Ware, Cross and Young. In Italy the disease was considered with attention by Speranza. The chief English writers on it since the time of Armstrong are, Blake, Howship, A. H. Renton, Bright, and Stephen. Though neither upon its precise nature, nor the best mode of treatment, can the opinions of the profession be said to be fixed, there is now perhaps a sufficient proportion of facts before the public to enable the physician to perceive, that, though allied to *meningitis* in general characters, it differs, nevertheless, both in certain pathological peculiarities, and in the treatment which it occasionally requires.

This distemper, which, for reasons which shall presently appear, I propose to distinguish by the name of *Meningitis phantasmatophora*, and methystic brain-fever (*μεθυσω ebrius sum*)

is peculiar, in the circumstance, that it occurs either in those who habitually drink ardent spirits, whether pure or diluted, or in those who take opium, but mostly in the former. It makes its approach in different modes, according as the individual has been continuing his potations, or has suddenly and completely abandoned them.

In the former case, in which the patients are generally persons who never get completely intoxicated, but are incessantly taking small quantities of spirituous liquors, the symptoms of the disease may come on at any time without warning or premonitory indications. But in general it is observed that the person about to be attacked sleeps badly, that his nights are interrupted by frightful dreams and cries of terror, (*panophobia*,) and that he rises in the morning unrefreshed, pale, and without desire for food. Occasionally he becomes sick, and rejects by vomiting what he has taken to breakfast. Very moderate exertion of body makes him perspire profusely, and any thing affecting his mind throws him into a state of tremulous agitation. At the same time he dislikes solitude, and becomes apprehensive and timid when left alone. The approach of night is generally contemplated with more or less horror, and he is unwilling to be left in the dark, (*Scotophobia*,) while his nights become more sleepless, and his dreams more frightful, (*panophobia*.)

After a night or two spent in this manner, the patient looks flurried, and is restless, apprehensive, and alarmed. He speaks incoherently, and expresses extreme and generally groundless apprehensions about his own affairs, and in no long time complains that he sees objects and sights in situations in which they are not, and which have no real existence, or betrays the most dreadful alarm at hideous objects which he imagines are threatening him with immediate destruction. Thus one patient complains that a frightful-looking huge dog is constantly running at him with open mouth; another that he is assailed with innumerable rats; another that an animal altogether imaginary, but of the most hideous aspect, is threatening him. In those cases, in which the illusions assume the most hideous appearances, the delirium is generally of a character partly furious, partly timorous; the patient is extremely restless, and cannot be calmed or kept quiet, and, though constantly moving, is unwilling to be left alone. In other cases the illusions may be of a less alarming character, and the patient, who describes them

distinctly, is much calmer, and more collected. In one case of the latter kind, the patient informed me that he witnessed distinctly a funeral procession, observed the part of the apartment to which he imagined it proceeded, saw the individual figures with considerable distinctness, and after the process of interment was completed, he observed one individual take off his hat and make him a bow. It is interesting to remark, that, notwithstanding this inauspicious vision, the patient made, under the use of suitable means, a speedy and complete recovery. In many instances the recollection seems very confused and impaired. The patient imagines he is not in his own house, and thinks he has for some great misdemeanour or crime been removed to some place of confinement and seclusion. In certain cases again the patient imagines that several persons are conspiring to cause him some serious and irreparable injury; and he consequently views various friends with suspicion and distrust, which would otherwise appear causeless. In some cases the derangement partakes of a religious character; the patient believes he has committed some heinous sin for which there is no forgiveness; he believes that he deserves everlasting punishment; and he is firmly convinced that Satan, whom, he contends, he beholds waiting for him, is ready to carry him off to adamantine chains and penal fire. In short, the mental derangement may depend on hallucinations, which relate either to the patient's habitual pursuits, or to certain schemes and adventures of which he has been recently thinking. In some instances these hallucinations are not confined to the sense of sight, but may extend to that of hearing; and the patient may imagine that he hears certain sounds which have no material cause or existence.

With this form of delirium there is always associated more or less derangement in several other functions. The patient is generally void of all appetite, or may even be squeamish, and vomit at intervals. Sometimes he is thirsty, and calls loudly for liquor of various kinds; but often he is indifferent to the sensation of thirst. In several instances great aversion, and even dread, of all food and drink is evinced; and it is impossible to persuade the patient to partake of either. The tongue is at first covered with moist white, gray, or slate-coloured fur, and the organ when protruded is tremulous. The bowels are constipated, and less sensible than in the state of health to the action of medicine; and when they are emptied

artificially, the discharges are very dark-coloured,—the first generally consistent, the latter liquid, dark, and offensive. There are generally fulness and distension, and not unfrequently tenderness and pain in the epigastric, umbilical, and right hypochondriac regions; and sometimes the two hypochondriac regions give the patient the sensation as if they were drawn tightly together. The skin is bathed about the head and neck with a clammy, unctuous, cold moisture; but elsewhere, and especially at the feet, it is cold, dry, and imper-spirable.

The pulse varies from 96 to 110 or 120, sometimes 130; and though sometimes small and oppressed, is often full, voluminous, and throbbing. The carotid and temporal arteries beat most violently; those of the wrist less forcibly; and the anterior and posterior tibial arteries pulsate feebly enough. The action of the heart is in general unusually violent, and the cardiac beat is diffused over the whole chest. In several cases I have observed strong epigastric and abdominal pulsation, with more or less bellows-sound. The respiration is occasionally panting and irregular, but not necessarily otherwise morbid.

At the same time the restlessness is extreme. The patient is in constant agitation of mind and body; speaks almost incessantly, yet seldom adheres above a minute to one subject, and is constantly changing place, and looking for some new object. He cannot sleep, and dreads to be left alone, from the apprehension of the spectral visitations. With this restlessness, the upper extremities, and especially the hands, are in constant tremulous motion, such that they cannot be kept for two seconds in the same position, nor can the pulse, in many cases, be accurately numbered at the wrist. Though this tremulous motion of the arms, wrists, and hands is very general, it is not constant; and instances of the mental disorder, agitation, spectral illusions, and sleeplessness have been observed to take place without any tremors in the hands. According to my own observation, I must say that tremors are very rarely, almost never, seen in the young or middle-aged, or those whose muscular motions are not otherwise unsteady; that they are seldom seen in first attacks of the disease; and that they are principally observed in the cases of confirmed dram-drinkers, whose motions are always unsteady in the morning and early part of the day, until they take a certain proportion of their habitual stimulus.

The disease is said to commence in another mode, and under different circumstances. A person accustomed to take considerable quantities of spirituous liquors, or who has been drinking incessantly for days, suddenly leaves off, and is represented forthwith to be attacked with the characteristic corporeal agitation, mental disorder, spectral illusions, and sleeplessness. This view was at one time taken by Dr Armstrong,* and was afterwards adopted partially by Dr Wolff,† more decidedly by M. Wendt, Bruhl-Cramer,‡ and Mr Blake,§ and in certain circumstances by Dr Cross,|| and some other authors. Without positively denying that the disease may come on in this manner, I can only say, that I never witnessed an instance of this mode of development; and after perusing all the published cases extant, I cannot perceive that any of them, excepting the one recorded by Dr Armstrong, in the ninth volume of the Edinburgh Medical and Surgical Journal, (p. 146,) afford satisfactory evidence that the disease is induced in consequence of the sudden abstraction of the use of spirituous liquors, and even that case, I think, may be explained without having recourse to the supposition now mentioned. I have, on the contrary, never observed that the sudden and complete abstraction of these liquors aggravated the symptoms of the disease. I find further, that neither Berndt, Toepken, Hufeland, Andreae, Goeden, Siebergundi, nor any other foreign physician by whom the disease has been observed, admit that it is produced in this manner; and in all the cases recorded by them, the symptoms were developed after a continuance, more or less protracted, of stimulation by spirituous liquors. Finally, I must regard it as a strong confirmation of the justice of the view now given, that I find Dr Ware of Boston has separately arrived at the same conclusion, and states, that, in a large proportion of cases, no connection could be traced between abstinence from the habitual use of spirituous liquors and the formation of *delirium tremens*. ¶

* “ This disease most frequently occurs in habitual drunkards, and especially when, after repeated fits of intoxication, they suddenly lessen or leave off their ordinary stimulus for a time.”—Practical Illustrations, p. 498.

† Hufeland's Journal, Band liii. St. iv. Seite 127. Qct. 1821.

‡ C. Von Bruhl-Cramer über die Trunksucht. Berlin, 1819.

§ Edinburgh Med. and Surgical Journal, Vol. xix. p. 498. Ed. 1823.

|| Prize Dissertation on Delirium Tremens. Albany, 1832.

¶ Remarks on the History and Treatment of *Delirium tremens*. By John Ware, M. D. Boston, 1831.

It must be allowed, however, that the development of the symptoms of the disease in certain circumstances gives some colour to the statement made by the authors above-mentioned, that *delirium tremens* is the consequence of the sudden abstraction of spirituous liquors from a person habituated to their use. Thus a person of habits of the kind specified suffers a fracture of the leg, simple or compound, or a severe burn, undergoes a surgical operation, or is attacked by some local inflammatory disorder. Febrile symptoms ensue, and the patient is put under treatment, and perhaps among other therapeutic directions, the use of spirituous liquors is interdicted. It is not uncommon to observe symptoms of *delirium tremens* come on in such cases, and assume a high degree of intensity, or even terminate fatally. In such circumstances the appearance of the symptoms is ascribed to the sudden abstraction of a species of stimulus to which the individual has been habituated. The argument seems plausible, but it is by no means conclusive. It may be observed, that the mere febrile disorder consequent upon the injury, operation, or local disease is of itself quite sufficient, in constitutions so easily deranged, and in which the actions of the vascular and nervous systems have been so much perverted by the habitual use of spirituous liquors,—as they invariably are in persons of the class specified,—to induce with the febrile disorder all the symptoms of mental derangement and hallucination observed in *delirium tremens*.

It is to be further observed, that, in the cases in which the disease appears to succeed the sudden and complete abstinence from spirituous liquors, many of its incipient symptoms had been already established, and the abstinence which seemed the cause of the disorder, was a mere accidental effect of the loss of the usual desires and appetites.

In whatever manner the distemper begins, when once established it proceeds in a certain tenor and with particular symptoms, for three, five, or six days, at various rates of rapidity, and with various degrees of violence in the symptoms.

In all cases the thoughts are more or less confused, and the language irrational and violent, often expressive of extreme apprehension and hostility. The patient often imagines he is not in his own house, and this has been by some supposed to be peculiar to the delirium of brain-fever. This, however, is a mistake. It is common not only to brain-fever and typhous

fever, but to several forms of *mania*. In brain-fever, the mental alienation is often not attended with error in judgment. The individual reasons often correctly from false premises, and from facts which are without foundation. The mental alienation, in short, arises from the errors in sensation and perception, (*hallucinationes*,) and hence it is more or less strictly relative to points ascertained by sensible observation. In all cases there is much absence or indifference to all external objects and ordinary pursuits, and the individual is occupied in thinking concerning subjects, which constitute a peculiar and distinct train of thought, and hence he mutters, or thinks aloud, as it is termed, without seeming aware that he is doing so. In all cases also, if any attempt be made to contradict him flatly or thwart him, he becomes more furious and unmanageable, and is sometimes thrown into a fit of violent raving passion. In all cases, also, there is more or less sleeplessness, (*pervigilium*; *agrypnia*,) and dread of being left alone, or in the dark (*scotophobia*.)

In all cases, also, the expression is wild, anxious; and agitated; the eyes are restless, injected, and incessantly in motion. The countenance is frequently pale, with contraction of the features at the onset of the disease; but as it proceeds the face, and especially the cheeks, become flushed. Afterwards, however, the face is pale and dingy, and the features pinched.

In all cases, the pulse, which is at first full and rather hard, but afterwards soft, small, and feeble, is frequent; from 100 to 120 or 136. The tongue is covered with a whitish or yellowish fur, at first moist, afterwards dry. The skin, especially about the head and neck, is moist but cold; and the extremities are cold. The bowels are in all cases more or less constipated, sometimes obstinately so, and not easily affected by medicine. The appetite is gone, and vomiting takes place at intervals.

After the symptoms of restlessness and sleeplessness have continued for three or four days, the patient, worn out by his incessant efforts, may either fall into a disturbed broken slumber, which at length terminates in sound sleep lasting for some hours, or the symptoms may pass into a state of *typhomania* (*coma vigil*) with constant muttering, *subsultus tendinum*, picking of the bed-clothes (*carphologia*,) while the pupils are much contracted, the features are in a state of constant twitching

motion, and the lower jaw and tongue are moved incessantly; and either coma terminates in complete death, or convulsions extinguish life immediately.

In the most favourable cases, when sleep comes on, either spontaneously or, as more frequently happens, in consequence of the administration of remedies, if it continue quiet and uninterrupted for some hours, with increasing warmth of the extremities, and without sopor or convulsion, or increase in the celerity of the pulse or respiration, and the patient awakes at the close of it much more calm and collected, with less violence, and less continued incoherence of thought and language, with a less frequent and a more firm pulse, and altogether in a more rational and manageable state. If he continue to sleep in a quiet and tranquil manner, the incoherence in thought and language is successively abated, until it entirely disappears, the muscular motions become more steady, the spectral illusions cease to recur, the pulse falls gradually to the natural standard, the tongue becomes clean, and the skin moist and warm, and the natural appetites for food and drink return.

This is the usual course of the disease in first attacks, in young or middle-aged robust, or at least not very unhealthy subjects, and in cases where it is practicable to employ remedies with energy and promptitude.

In cases, on the other hand, in which the disease has recurred more than once, in cases of persons long habituated to the use of spirituous liquors, in cases of persons advanced in age, and in those in whom there are symptoms of previous disease of the lungs, heart, liver, or arterial system, the disease very rarely takes this favourable course. The delirium, though not very violent, is accompanied with constant sleeplessness and restlessness, with great apprehension and timidity, and passes more or less rapidly into stupor and coma, which are generally the precursors of speedy dissolution.

In all those cases also in which the delirium is violent, and the sleeplessness continues incessant, the powers of the patient are much more quickly exhausted, and fatal stupor and coma more rapidly ensue.

The duration of the disease varies from three or four to five or seven days. In most cases it terminates either favourably or fatally in the space of from three to five days. In certain cases, I have seen all the urgent symptoms of confusion

in thought and language, and irregularity in conduct subside, and the patient recover consciousness of his true situation, seem calm and collected, and express himself rationally,—while the pulse fell to 90 or 86, and the tongue alone continued covered with a white or yellow viscid fur. Yet in the course of a day or two, after some transitory symptoms of slight headach and delirium, stupor and drowsiness came on, and passed speedily into fatal coma.

In other cases, again, the urgent symptoms of violent delirium, sleeplessness, and incessant talking and vociferation may be abated, and the patient may continue for a day or even longer in a state of comparative calm and tranquillity. Yet, without any obvious cause, all the symptoms may recur, and, though not so violent in form as at first, continue, with occasional fits of maniacal language and conduct, alternating with intervals of quietude and rational behaviour; and be protracted in this manner for weeks. The patient is then found to be in a state of chronic brain-fever, and may either be cut off, as in the acute form, or become maniacal or fatuous.

MORBID ANATOMY.—In the bodies of persons destroyed during the course of brain-fever, the appearances vary according as the disease has attacked once or oftener, and as the patient is in the prime of life or in advanced age.

In cases in which the disease has attacked only once or twice, the arachnoid membrane is more or less elevated by effusion of serous fluid into the subjacent filamentous tissue. The arachnoid also appears in many points, especially along the upper surface of the hemispheres and the base of the brain, to be rendered opaque and thick,—appearances which can in all cases be traced to the infiltration of the serous or sero-albuminous fluid already mentioned, into the subarachnoid tissue. This fluid is always most copious over the *sulci* between the convolutions.

In certain cases a quantity of serous fluid is found between the *dura mater* and the arachnoid membrane, or within the cavity of the arachnoid membrane.

The vessels of the *pia mater* are always large, numerous, and distended, with a considerable quantity of dark-coloured blood; and the whole membrane, especially at its cerebral surface and attachments (*tomenta*,) is highly vascular, and the vessels are minutely injected.

The sinuses of the brain are much loaded with semifluid dark-coloured blood. The arteries at the base of the brain

are more or less distended with dark-coloured gory blood. The arteries of the brain are often occupied with opaque spots of steatomatous matter, which gives them a rigid appearance. The substance of the brain, both convoluted and central, presents a considerable number of points and streaks freely effusing fluid blood; and the whole brain discharges at every incision a considerable quantity of serous fluid, with which its substance is infiltrated.

The ventricles contain from half an ounce to one ounce or one ounce and a-half of serous fluid; their surface presents veins distended with dark-coloured blood; and their capacity is dilated, the former being elevated, and the posterior *cornu* distended backwards.

The annular protuberance (*Pons Varolii*), and the bulb of the chord present red lines or transverse streaks; and the chord itself, as well as the parts now mentioned, are, like the brain, infiltrated with serous fluid.

Howship found the meningeal veins containing much thin, pale, watery blood, and in some instances globules of air.

More or less serous fluid always escapes from the interior of the vertebral canal when the chord is divided; and this is found to be contained chiefly between the vertebral *dura mater* and the *ligamentum denticulatum*.

The lungs are more or less, in general, considerably loaded with dark-coloured blood, especially towards their posterior regions; and bloody frothy serum issues from incisions made in their substance.

A small quantity of serum is usually found within the cavity of each *pleura*, and also within the cavity of the *pericardium*.

The right chambers of the heart are distended with blood. The left less so, and are sometimes almost empty.

The stomach if contracted presents a considerable number of large *rugæ* in its villous membrane, which is also thickened, and very frequently occupied with numerous red spots, especially on the tops of the *rugæ*. These red spots seem in general to be ecchymotic spots in the villous membrane; but in certain cases, especially if death have taken place early, they consist of blood in minute points and vessels. The villous membrane is sometimes firm, in other instances, especially along the large or cardiac chambers, it is softened, and comes away in shreds and slips. In other cases the gastric villous membrane is of a general red colour, but without marks of red injection or vascularity.

The villous membrane of the duodenum is generally firmer and thicker than natural. That of the jejunum and ileum presents no constant appearance. Occasionally it is slightly thickened, but not often softened, and the vascularity which is seen in various parts is most generally referable to dependent position.

The liver is always more or less loaded with dark-coloured viscid semifluid blood, which flows sluggishly from the divided vessels. The substance of the organ may be of a deep reddish brown, pulpy and œdematous, at least receiving the impression of the finger; or it may present incipient or confirmed enlargement of the *acini*, (hypertrophy,) which then assume an orange-yellow or brownish colour, and are more distinctly seen than usual. In some instances the organ presents more or less of the fatty transformation, giving the knife a greasy appearance, and imparting to paper an oily stain. The organ may be normal in size, diminished, or increased. Most usually it is increased with accumulation of blood in its vessels. When diminished it seems shrunk and firmer than natural.

In cases in which the attacks of the disease have been repeated two or three times, the chief circumstance is the larger quantity of serous fluid effused into the subarachnoid tissue, and generally a degree of atrophy of the convolutions of the brain. The serous fluid infiltrated insinuates itself into the *sulci* between the convolutions, and separates them more or less from each other, compressing them and diminishing their breadth; and when it is abundant, it compresses their summits, and also diminishes their size in that direction. The serum contained within the ventricles is also more turbid than in recent cases, and usually more copious.

The arteries of the brain are generally much more rigid, and the opaque darkish or gray patches are more numerous and larger; the arterial tissues, in short, are more completely and generally diseased.

The lungs present more or less emphysema; they do not crepitate, as in the sound state, but are inelastic and pulpy; their substance is more or less completely darkened with bloody accumulation and serum; and they are soft, œdematous, and lacerable. The bronchial tubes present a large quantity of viscid mucus adherent to the mucous membrane, and generally stained with blood.

The villous membrane of the stomach is usually of a deep, generally brick-red colour; and red patches, points, and vessels are much less common. Often the villous membrane is mammillated and softened, and sometimes attenuated.

The duodenal villous membrane is often granular and firm. In some cases the spleen is softened.

The most uniform change, however, in persons who have had several attacks of brain-fever, and especially if beyond forty, forty-five, or fifty years of age, is steatomatous degeneration of the middle coat of the arteries, with a thick, irregular, rugous, and sometimes verrucose or warty appearance of the inner surface of the arteries. This is found first and most extensively in general in the thoracic aorta and its primary branches, the *innominata* and left subclavian and carotid, and the change is continued through the descending portion of the thoracic aorta, and into the abdominal portion. It occupies, indeed, the greater part, sometimes the whole, of the arterial system; and the deposition is always first observed, and most abundantly found, at those points where trunks are divided into branches. Very generally the cerebral arteries partake extensively in this changed structure.

In some instances, it is found that the cortical or secreting part of the kidneys are transformed into whitish, gray, or fawn-coloured homogeneous granules, while the original structure is either partially or entirely gone.

OPINIONS ON THE NOSOLOGICAL PLACE AND PATHOLOGICAL NATURE OF THE DISEASE.—In the first accounts of this disorder by Dr Burton Pearson and Dr Armstrong, although the symptoms were described under the name of Brain-Fever, and the disease was carefully distinguished from *phrenitis*, (*meningitis*,) typhous fever and mania, yet no very distinct notions were communicated on its peculiar and essential nature. Dr Sutton, who gave it the name of *Delirium Tremens*, distinguished it from *phrenitis*, regarded it as an idiopathic affection of the brain, (51 and 52,) beginning not necessarily with febrile seizure, but attended with more or less insensibility (confusion of thought and unconsciousness?) and wandering, with much restlessness and exertion; yet did not express any very clear opinion on its peculiarities. Dr Armstrong, in the publication of his more matured views, admitted the circumstance of congestion of the brain, and contended at the

same time, that the tone of the stomach was probably impaired, and that the circulation in the liver was deranged, and accompanied with congestion, and the accumulation of unhealthy secretions in the intestinal tube. Little doubt can be entertained that this was an essential improvement in the etiology of the distemper.

Dr Wood of Newcastle * appears to have been inclined to ascribe the symptoms to a state of the brain, irritative and congestive, if not inflammatory, as he inculcated very strongly the necessity and the beneficial effects of cold applications to the head, and a method of treatment, the reverse, in a great measure, of the plan, by opium and stimulants, recommended by Dr Burton Pearson and Dr Sutton.

Similar views regarding the previous and concomitant state of disorder of the stomach, induced by excessive stimulation with ardent spirits, were strongly inculcated in 1817 by Dr Klapp of Philadelphia, and made the basis of his therapeutic method, which consisted chiefly of vomiting and catharsis, by large and repeated doses of tartar emetic. † These views were afterwards defended by Dr James M. Staughton, an American Graduate, in 1821.

Though the thesis of Rayer was published in 1819, at Paris, and an essay by Dr Bruhl-Cramer appeared the same year at Stockholm, the disease attracted on the continent little attention till the year 1820, when Dr Philip Heineken of Bremen published a German translation of the work of Dr Sutton, preceded by a preface by Dr Albers. In 1822, Dr Heineken himself published some observations, in which he maintained that the fatality of the disease is often attributable to the violent tension of the vascular system, and that opium is not in all cases a safe or even harmless remedy. The same year, Dr Berndt of Custrin published two favourable and one fatal case, with some judicious observations, in which he endeavoured to show that all the symptoms depended on excessive irritation of the nervous and vascular systems, with habitual plethora of the brain, sympathizing with deranged action in the stomach. ‡ Not essentially dissimilar was the view taken by Dr Töpken of

* Edin. Med. and Surgical Journal, Vol. xiii. p. 438. Edinburgh, 1817.

† On *Mania a Temulentia*. By Joseph Klapp, M. D. Eclectic Repertory, Vol. vii. Philadelphia, 1817. A memoir on Temulent Diseases; by Joseph Klapp, M. D. Physician to the Philadelphia Infirmary. Philadelphia, 1818.

‡ Hufeland's Journal, Band lv. St. v. seite 86. Berlin, 1822.

Bremen, who, at the same time, in publishing three cases, considered the disease as an irritative state of the brain, (*Erethismus Cerebri*), proceeding from previous derangement in the stomach and liver, and thereby through the medium of the coeliac plexus reacting on the brain. *

The notion of an inflammatory, or at least a congestive state, of the cerebral vessels, causing irritation to the organ, appears to have been very generally adopted after this period in Germany and Italy. In 1821, indeed, Joseph Frank had already stated his opinion, that the disease, if not always consisting in inflammation, was at least very closely allied to that process; † and in this opinion he was followed by Speranza, Hildenbrand, and Andreae.

Without assenting to the uniform and constant circumstance of inflammation as a cause of the phantasmic delirium, Hufeland distinguished four states of the brain, in either of which delirium might occur; 1st, the sanguine-inflammatory; 2d, the nervous or erethistic, without congestion or inflammation; 3d, the sympathetic; and 4th, the adynamic or passive, from simple feebleness. Distinguishing also the pernicious effects of the habitual employment of spirituous liquors into acute and chronic poisoning, he considered the latter as an enfeebling process, weakening the brain by long previous over-irritation and excitement. ‡

The impossibility of admitting the existence of the inflammatory state in all cases of methystic brain-fever, as a uniform occurrence, was evidently suggested to Hufeland, not only by the mode in which various cases recovered, but by the facts and arguments adduced by Dr Kriebel of Berlin, who denied at once the doctrine advanced by Berndt and Töpken on the inflammatory character of the disorder, and from a careful consideration of the causes, the seat, and the phenomena of the disease, was disposed to refer it, under the name of drunkards' derangement, (*Wahnsinn der Säufer*), (*Delirium potato-*

* Hufeland's Journal, Band lv. St. vi. seite 59. Berlin, 1822.

† Praxeos Medicae Universae Praecepta, auctore Joseph Frank. Partis, 2da. Vol. ii. Taurini, 1821. P. 250.

‡ These principles are shortly stated and illustrated, and made the basis of treatment in an introductory notice prefixed to a case by Dr Behr of Bernburg, a short essay by Dr Kriebel of Berlin, and the first part of a more elaborate memoir by Dr Andreae of Magdeburgh. Hufeland's Journal, Band lviii. St. iv. Seite i. Berlin, 1824.

rum) to the head of nervous diseases, and the genus *Hallucination*. *

At the same time, a powerful advocate for the inflammatory nature of the disorder appeared in Dr Andreae of Magdeburgh, who, after examining carefully the diagnostic signs given by Sutton to distinguish the disease from *meningitis*, showed that neither in the preliminary symptoms, nor those indicating the presence of the disease, did they differ in kind; and proved, both from the symptoms during life and the appearances found in the dead body, that the disease was a form of cerebral inflammation, peculiar, however, to drunkards, and modified by the remote cause and the persons in whom it occurs.†

The opinion of Mr Blake as to the nature of the affection is not very precise. He regarded it as indirect debility of the nervous energy, succeeded by a morbid increased action in the brain and nerves, with delirium, and terminating either in profound sleep, or in effusion in the brain. He does not attempt more closely to characterize the nature of the morbid increased action, further than by saying, that, as it presents three stages, one of exhaustion or indirect debility, one of excitement, and one of sopor, quiescence, or coma, it may be likened to the cold, the hot, and the sweating stages of ague.‡

In the next memoir of any importance, that, namely, by Leveillé, the brain-fever or delirium of drunkards is regarded as an entirely nervous disorder (*neurosis*,) an affection of the brain, (*encephalopathia*,) unconnected with vascular congestion, or marks of arachnoid inflammation,—an exaltation, as the author terms it, of the vital properties of the brain, induced by the spirituous particles absorbed from the surface of the gastro-enteric passages, and conveyed into the current of the circulation. Though this be the usual character of the disorder in its simple form, Leveillé maintains that it is very liable to be complicated with *gastritis*, *enteritis*, or *gastro-enteritis*; and these circumstances chiefly, he thinks, have led some physicians to imagine that its symptoms were originally propagated from the chylopoietic organs in a state of disorder.§

* Hufeland's Journal, Band lviii. St. iv. Seite 9.

† Ibid Seite 43, and St. v. Seite 77.

‡ Edinburgh Medical and Surgical Journal, Vol. xix. p. 497. Edinburgh, 1823.

§ Memoires de l'Academie Royale de Medecine, Tome i. Read 1825. Paris, 1828.

An opinion not quite dissimilar was announced the same year, 1825, by Dr Goeden of Berlin, who considered the disorder as nervous originally, but placed its seat in the solar or coeliac plexus, and regarded the brain as affected only in a secondary and sympathetic manner.

When we revert to the United States, we find that the opinions, where they are precise and definite, are divided between those who trace the origin of the disease to gastric, gastro-hepatic, or gastro-enteric disorder, and those who regard it as a mere nervous malady. Thus Dr Coates, whose paper appeared in the fourth volume of the North American Medical and Surgical Journal in 1827, regards it as a nervous delirium, consisting in an heightened activity of the sensorium, arising from the generation in the brain of an unusual vital power, not exhausted, as in ordinary circumstances, by the narcotic poisons habitually used.—(The North American Med. and Surg. Journ. Vol. iv. 225.) He allows, farther, that this exalted activity may be complicated with other disorder. Not very dissimilar is the opinion of Dr Carter, according to whom the disease consists essentially in morbid excitement of the brain, exemplified by increased activity in its functions, with depression of the functions of organic life.—(American Journ. of Med. Science, No. xii. 324. 1830.)

On the other hand, Dr Baron of Charleston maintains strongly, in imitation of Dr Klapp and Dr Staughton, that the symptoms of the disease owe their origin primarily to gastric inflammation, induced by the repeated and long-continued irritation of the villous membrane of the stomach, by the unnatural and excessive stimuli employed.—(Baltimore Med. and Surg. Journ. and Rev. No. iii. 35, &c. Baltimore, 1834.)

By others, again, as Dr Cross and Dr Young, a more complex view of the disease is taken. The former distinguishes the disease into four varieties, the *sthenic*, or that consisting in vascular irritation; the *hypersthenic*, or that with inflammation; the *asthenic*, or that with nervous irritation; and the *bilious*, or that with gastric and gastro-hepatic disorder. (Trans. Med. Soc. New York. Albany, 1832.) The latter considers the disease as occasionally irritative and nervous, requiring sedatives and narcotics only, and sometimes congestive and inflammatory, requiring the employment of depletion. (American Journ. of Med. Science, Feb. 1836.)

The most recent authority in this country, viz. Dr Bright, regards the disease as a variety of meningeal inflammation modified, however, by irritation. (Hospital Reports, Vol. ii. Part i. London, 1831.)

Dr Siebergundi of Dorsten, still more recently, has, after a full view of all the opinions maintained by different authors, arrived at a conclusion, which, so far as it is intelligible, approaches to the notions of those English and American physicians who consider the brain-fever as a nervous malady. According to this physician it must, from these circumstances, be inferred, that the fundamental cause of brain-fever consists in a direct exaltation (activity) of the sensible vital-factors, produced by alcoholization of the brain and nerves, as representing expansibility, and in a direct depression (passivity) of irritability, as indicator of the contractive vital-factors, but which first becomes durable and permanent, so as to produce this form of disorder, when any disturbing agent displays its power in the alcoholized economy, and the equilibrium is so subverted that the balance can no longer be restored by means of sound sleep. (Hufeland's Journal, Bd. lxxx. St. iv. S. 25.)

PATHOLOGICAL DEDUCTIONS.—The preceding account of the necroscopic appearances is applicable solely to the fatal forms of the disease, and shows only a certain number of morbid effects, without furnishing much information on the nature of the disease, or the true cause of these effects. It is still requisite to consider, whether, from these effects, taken with the nature and course of the symptoms, and considered with reference to the remote and exciting causes of this disease, a consistent and rational pathological theory of it can be framed.

It is first requisite to consider whether there ever are instances of brain-fever occurring, independently of the alleged cause of the use of spirituous liquors.

On this point I may mention, that certainly symptoms in many respects similar, if not the same, are seen in individuals much reduced by loss of blood. In a case of profuse hemoptysis, in a young person of sixteen, in which I found it requisite to take away about forty ounces of blood in the course of twenty-four hours, great irritability of the system, with sleeplessness, restlessness, apprehension, and distinct spectral illusions, ensued. These symptoms, however, subsided after sleep came on. In the case of a plethoric young married woman, from whom

I found it requisite to detract forty ounces of blood, for distinct symptoms of puerperal fever, a fright received by the noisy behaviour of neighbours made the pulse rise from 110 to 140, with great alarm and apprehension, incoherence in language and conduct, and spectral illusions. These symptoms, however, disappeared after a sound sleep, produced by a large dose of an opiate. In the first of these cases spirituous liquors had not been used; and if they were in the second, it was without my knowledge.

Similar examples of slight symptoms of spectral delirium after profuse evacuation are mentioned by Dr Bright, who is disposed to ascribe their occurrence to the evacuation, independent of the use of spirituous stimuli.* It is also certain that similar symptoms take place in the wounded on the field of battle, and in military hospitals, and also in the case of females extremely reduced by uterine hemorrhage.

So far as this evidence goes, all that can be inferred is, that symptoms similar to those of the brain-fever of drunkards may occur in consequence of profuse evacuation from the vascular system.

But the main point is, to inquire what is the nature of the relation between the use of spirituous liquors, and the production of the symptoms of spectral brain-fever; and in this we shall find that the evidence is in many respects clear and conclusive.

It appears, in the first place, that the disease occurs with its characteristic symptoms, and in its genuine form, only in persons who are accustomed to indulge more or less freely in the habitual or in the excessive use of spirituous liquors. It may appear in persons not habitual drinkers, but in consequence of the excessive use of spirituous liquors for some time. But the persons, in whom it most usually occurs, are those who have been for a considerable time in the habit of taking spirituous liquors, so as to maintain a constant state of slight but steady stimulation. Nor does it require in these persons actual intoxication. I have seen a considerable number of persons, presenting at different periods of their lives, a distinct fit of brain-fever, yet who perhaps had never been thoroughly intoxicated during a long series of years.

Persons of this kind are easily distinguished by a good ob-

* Hospital Reports, Vol. ii. Part i. p. 22. 4to. London, 1831.

server, especially if he be a water-drinker, a habit which has a singular degree of power in preserving the senses, but especially that of smell, in a high degree of energy. The breath, the clothes, and every part of the persons of these habitual but moderate drinkers exhales a distinct alcoholic and saccharine odour, more or less strong, and which is only acquired by every part of the body being long thoroughly imbued with the spirituous aroma. The system is never suffered to exhale thoroughly the aroma; and no sooner is one day's drinking exhaled, than the materials of a second are furnished.

Persons of this class are very liable to an attack of the disease, if seized with common catarrh, fever, or inflammation, or much disorder of the intestinal tube; and because the symptoms appear at this time, while under treatment, it is usual to ascribe them to the sudden removal and interruption of the wonted stimulation. It is certain that after depletion in this class of individuals, the symptoms generally show themselves, or, if already present, are aggravated, and very often proceed to the fatal termination.

As a proof of the facility with which the disease is produced in this class of individuals, I mention that I knew one person, who, while he was in the habit of indulging in this manner, had for years, during the night, spectral illusions and frightful dreams, so distressing, that he was unable to be left alone in the dark in his bed-chamber; and, with or without the light, he was occasionally heard to scream out and rave deliriously on objects which had no existence. These symptoms disappeared greatly after he ceased to drink habitually, and they entirely disappeared, with great improvement of general health, as the practice was abandoned. In another case in which the individual had for a long series of years been in the habit of drinking always three or four glasses of spirits daily, sometimes more, though never to intoxication, with no other effect than that of tremulousness of the wrists and hands,—the symptoms of brain-fever, with spectral illusions, frightful apparitions, and extreme tremulousness, came on at the sixtieth year, and proceeded to the fatal termination in the course of a few days.

These several facts, and more that might be mentioned, show that the habitual use of spirituous liquors induces the predisposition to be attacked with spectral brain-fever. The next question comes to be, do we know any thing of the mode in which they induce this predisposition? Though I will not

conceal the extreme difficulty of this inquiry, I think the following facts may throw some light upon the subject.

The account above given of the necroscopic appearances shows that the bodies of persons dying of the spirituous brain-fever presents two orders of changes; one set of long duration, or which at least must have taken some considerable time before they could be completed;—another set of shorter duration, and which probably were more closely connected with the immediate symptoms which preceded the fatal event.

To the first head I refer the steatomatous deposition in, and transformation of, the arterial tissues; disease of the bronchial tubes, with emphysema and bloody congestion and serous infiltration in the lungs, disease of the liver, disease of the duodenum, and disease of the kidneys. To the same head also I must refer some of the morbid appearances in the cerebral membranes and brain, especially the atrophy of the convolutions, part of the subarachnoid infiltration, and the steatomatous, ossified, or rigid state of the cerebral arteries. Those who are familiar with the examination of dead bodies, are aware that these appearances are very commonly met with in the bodies of spirit-drinkers, in whom the symptoms of spectral and tremulous brain-fever have not preceded the fatal event. In several of these persons, in whom death has taken place from different diseases, I have found, almost uniformly, not only steatomatous degeneration of the cerebral arteries, but copious infiltration of serous fluid into the subarachnoid tissue, causing thickening and opacity of the membranes, atrophy of the convolutions, and *œdema* of the brain. There are indeed instances in which this serous infiltration is so copious in the brains of these habitual drunkards, without giving rise to symptoms of phantasmatic brain-fever, that to those unaccustomed, it might appear extraordinary that the functions of the brain were not altogether suspended, or even that life was continued at all, with such a large quantity of sero-albuminous fluid extravasated, and exercising on the brain an undue degree of compression. There is no doubt that the only circumstance, which enables the organ to continue its functions, is the peculiarity, that this fluid has been effused by slow and gradual steps, and that the brain has in this manner become accustomed to its presence.

To the second head I refer the subarachnoid and intra-ventricular serous effusion, the cerebral infiltration, the dark-co-

loured congestion of the vessels of the *pia mater* and choroid plexus, and the occasional pink coloration and vascularity of the *crura cerebri* and annular protuberance. What is the connection between these two orders of changes and the habitual use of spirituous liquors.

The clearest mode of obtaining proper views on this subject is to consider the effects of their presence, in the natural physiological order, as they act upon different organs and systems, from their first introduction within the economy.

1. When spirituous liquors are introduced into the stomach they have a fourfold operation. *First*, they coagulate more or less all albuminous articles of food or drink within the organ. *Secondly*, they act as chemical agents in stimulating the tissues, but especially the villous membrane of the stomach, and inducing slight crispatation. *Thirdly*, the effect of this chemical action upon the gastric tissues is to cause more or less vital reaction of these tissues, where the chemical action is not sufficiently energetic to indurate or destroy the tissues. *Fourthly*, they are partly absorbed by the veins, and conveyed in the direction of the circulating current to the venous trunks, and by this means to the liver, the lungs, the heart, and the brain.

The first three are the only immediate effects in the stomach. The fourth and last is a remote consequence, which requires subsequent consideration.

In the first three kinds of effects, it is impossible not to recognize a morbid and very detrimental operation. The coagulation of the albuminous articles of food and drink, though an analogous and simultaneous change to that produced by the gastric fluid and mucus, is still different from that, as it renders these articles afterwards more difficultly soluble by the gastric fluid. The over-excitement and irritation of the gastric villous membrane is also highly injurious, in so far as it first accumulates, and then causes to stagnate, the blood in the gastric blood-vessels,—first suspends, and then unduly augments the secretion of gastric fluid. This undue excitation is, after a certain period, followed by positive irritation, and then, as is ever the case, with an extreme degree of languor and relaxation in the gastric villous membrane. Spirit-drinkers have at times in the early stage of their habits an unnaturally voracious appetite, (*bulimia*;) but after some time they suffer total disrelish of food (*anorexia*,) are unable to eat, and have various dyspeptic symptoms, *e. g.* stomach-ach (*gastrodynia*,) water brash (*pyrosis*,) heart-

burn (*cardialgia*,) flatulence, and sometimes squeamishness and vomiting. It is known from various facts disclosed by the examination of the stomach and *duodenum* of spirit-drinkers, and even wine-bibbers, but above all from the observations made by Dr Beaumont in the living body of St Martine, that the use of these liquors in any quantity gives rise to various morbid states, as erythematous redness, the formation of *aphthae*, and secretion of bloody mucus, with tendency to effuse blood, and that, though these appearances take place without uneasy sensations or external symptoms, yet, when long continued, they are connected with the symptoms now specified.

A constipated and tardy state of the intestinal tube, generally with considerable hebetude or *inertia*, is a common consequence of the practice, and is perhaps to be ascribed partly to the perverted action in the gastric and gastro-duodenal villous membrane, partly to some changes in the hepatic circulation to be immediately noticed.

2. Besides the primary effects now mentioned, the presence of spirituous liquors in the alimentary canal gives rise to remote and ulterior consequences in the vascular system of different organs.

Spirituous liquors in the stomach and *duodenum* stimulate unquestionably and contract the tunics of the blood-vessels, both arterial and venous. They can scarcely, however, enter the former set of vessels, in which the course of the blood tends necessarily from the trunks to branches; but when in the capillary vessels they may very easily be absorbed by the veins, and conveyed with the blood from the small veins to the large ones.

a. The first course which spirituous liquors, therefore, must pursue, when once within the vascular system of the alimentary canal, is along the different veins which concur to form the portal vein, and thence by means of its branches through the whole liver. In this organ there is no doubt that the presence of these fluids, in however diluted a form, cannot fail to retard the motion of the blood, and consequently to produce congestion and accumulation, and impede the secretion of the gland. It is consistent with all observation of the effects of spirituous liquors, that their use is followed by congestion of the liver, impaired secretion of bile, enlargement of the organ, hypertrophy of its *acini* and various other changes, influencing the action of the gland, and the function of digestion.

This congested state of the hepatic vessels, and the impeded secretion of bile, seems to be a frequent and powerful cause of the constipated state of the bowels. As the bile is neither secreted in due quantity nor in proper quality, the requisite changes are not effected on the alimentary mass within the *duodenum*, nor are the excrementitious matters separated from the nutritious, and expelled from the lower part of the intestines with the requisite regularity.

b. Though the spirituous matters thus absorbed into the vascular system may exercise their first effects on the vessels of the liver, yet to the vessels of this gland these effects are not confined. As the supply is incessantly renewed, after they have passed through the vessels of the liver, they are conveyed by the branches of the *vena cava hepatica* into the *vena cava* and right chambers of the heart, and follow the general course of the venous current from the latter by the pulmonary artery through the lungs. In this course, whatever may be believed, and asserted to the contrary, they unquestionably retard the motion of the blood, and produce temporary congestion of the whole system of the pulmonary capillary vessels. It is hence that the respiration is always, under the influence of spirituous stimulants, rendered a few times, *i. e.* from four to six, more frequent than natural, and that various symptoms of accumulation within the chest and pulmonary congestion are induced.

Following, however, the course of the circulation, the spirit-charged blood reaches the left auricle and ventricle and the aorta; and while it is distributed to the heart and along the whole aortic tree and branches, it is also sent to the head and the meningeal and cerebral vessels, and again by means of the bronchial arteries to the bronchial tubes and lungs.

In this course it may and unquestionably does produce a morbid state of the vascular system and circulation in two organs simultaneously, *viz.* in the lungs and in the brain.

In the lungs spirit-charged blood conveyed by two sources concurs to produce a morbid state in two orders of vessels. *First*, as already stated, the blood in the capillary system of the pulmonary artery and the vessels themselves are influenced by this agent. *Secondly*, the blood conveyed into the bronchial arteries is under the influence of the same agent. It is chiefly from the retarded motion thus induced, and the consequent accumulation of blood in both sets of vessels in the lungs, that

in spirit-drinkers, chronic cough and more or less difficult breathing, sometimes asthma, are frequent complaints. The blood in the pulmonary artery, on the one hand, is imperfectly exposed to air, and is consequently not completely aerated or purified, and is thence conveyed to the left chambers in a much less pure state, and much less highly arterialized, than is requisite for the healthy performance of circulation in the different regions and organs of the body. The bronchial membrane also in these individuals becomes irritable, red, rough, and otherwise morbid, prepares a new viscid secretion, which adheres firmly to its surface, and impedes the entrance of air and its admission to the vesicles, and thus concurs with the already congested state in the pulmonary capillaries in deranging greatly the function of the lungs.

All the spirit-drinkers, whom I have ever seen or known, have been either subject to chronic cough and dyspnœa, or have laboured under chronic dry bronchial disorder, with asthma, and have been destroyed, either by an aggravated form of this disease, or by an acute attack of it, or by its giving rise to disease of the heart, and general dropsical infiltration.

It is singular that Dr Armstrong, in speaking of cough in one case of methystic brain-fever, though he allows that it is common to drunkards, yet adds, that it "often depends more upon the state of the stomach and circulation than the lungs themselves, and may frequently be speedily removed by stimulant remedies." This representation, I am obliged to say, is in several respects erroneous. Irritation of the bronchial membrane may, and often does, take place in spirit-drinkers in connection with disorder of the stomach; but it is the effect not only of this disorder, but of the general cause which induces the disorder of the stomach and the circulation. The subsequent observation by Dr Armstrong, that "in men of intemperate habits, this kind of cough is sometimes the precursor of hydrothorax and complaints of the liver," (Edinburgh Medical and Surgical Journal, ix. 151 and 152,) is a clear proof, if others were wanting, that the disease is dependent on disease of the bronchial membrane and heart.

When this morbid state of the pulmonary circulation is established, it gives rise to constant venous congestion within the head, and overloads the meningeal and cerebral vessels with an excessive quantity of venous blood, and a load of imperfectly

aerated arterial blood. In this manner the disposition to meningeal congestion and cerebral irritation is induced and rendered permanent in spirit-drinkers.

c. In the vessels of the brain the presence of this spirit-charged blood is not less pernicious. We have seen that the natural effect of the introduction of spirituous liquors into the stomach is, by inducing a slow circulation and congested condition of the venous system and the pulmonary artery, to cause indirectly meningeal and cerebral congestion, by impeding the return of the venous blood from the head. When these liquors are taken so habitually that they are never thoroughly eliminated from the economy, the arterial blood, or that sent to the different organs, becomes more or less impregnated with the spirituous material, and is in this state sent among other organs, to the brain. This cause of derangement and perversion of the capillary circulation, especially that of the brain, is always progressively increasing in mass, in power, and in effects. It hence results, that, between the venous congestion and the transmission to the membranes and brain by the arteries, of an imperfectly aerated and a spirit-charged blood, there is induced a more or less constant distension of the meningeal vessels with blood, which is at once changed in qualities, and is not allowed to perform the round of the circulation so rapidly and frequently as in the state of health.

On the exact mechanism by which this meningeal congestion from the habitual use of spirituous liquors is induced, different opinions may be entertained. According to one view, spirituous liquors act directly on the nervous system. According to the view already given, they are absorbed by the veins, and, through the medium of the vascular system, act on the nervous system. It is probable that they act in both modes; and it must be allowed that the latter is most accordant to the general facts of physiology. But whatever be the mode, it may, from many facts, be inferred, that their use is attended with an overloaded state of the meningeal and cerebral vessels. It might be imagined, and is usually said, that they cause a more rapid circulation in these vessels. But this has been admitted on most uncertain and erroneous grounds. These liquors evidently retard the motion of the blood in the vessels, and in this manner produce the congestion. The only fact adduced by the advocates of this increased circulation is the increased frequency and fulness of the pulse. This certainly shows that the heart contracts more frequently

in a given time than natural, but does not prove that a greater quantity of blood is propelled within a given time through the vessels. It demonstrates, on the contrary, increased resistance at the extremities of the arteries.

After the action of the spirituous stimulants has ceased, this resistance also ceases; the blood is suffered to move as formerly through the capillaries into the veins; and the different secretions, which were temporarily augmented or suspended, as they are, according to circumstances, return to their natural state.

3. That the use of spirituous liquors retards the motion of the blood within the vessels, I infer from the following facts. 1. Spirituous liquors, when mixed with blood out of the body, cause more or less coagulation, according to their strength and concentration. If pure, they instantly coagulate the fibrinous part of the blood. If diluted, they induce a slight but perceptible viscosity or spissitude of the blood. 2. Applied to the vessels of the lower animals they have the same effect. First they are followed by increased motion of the blood in the vessels, then retarded, then total stagnation. 3. In the mucous surfaces, both in the lower animals and in the human body, they not only astringe the organic texture and vessels, but they induce a degree of redness more or less deep and intense, and which is always attributable to retarded motion of blood within many minute vessels. 4. In certain of the lower animals, as in dogs, pure alcohol given in any considerable quantity proves fatal, and it causes death chiefly by producing general stagnation of the blood in all the vessels. 5. In the human body, though an overdose of spirituous liquor is apparently at first followed by increased frequency of the pulse, yet in a short time the pulse becomes rapid and small, while the extremities become cold; the power of generating heat is diminished or suspended in consequence of the retarded circulation of the blood in vessels of the lungs; and death ensues much in the manner of a universal asphyxia.

In the case of habitual spirit-drinkers, this retarded motion and consequent accumulation of blood in the meningeal vessels, is renewed daily, and several times daily; and it appears that in this manner there is gradually established in the membranes a vascular congestion, which irritates the brain, and renders it unable to perform its functions.

It is to be further observed, that the most certain effect of the habitual employment of spirituous liquors is to induce an

inflammatory state of the arterial tunics, both of the system at large, and of the cerebral arteries, and this very state itself cannot fail to derange the circulation of the meningeal and cerebral arteries.

4. It appears, therefore, that the habitual employment of spirituous liquors is adequate to induce a very unhealthy state of the meningeal and cerebral circulation, in other words, not only a predisposition to derangement, but actual disorder in the circulation of that organ and the functions thereon dependent. It is important to observe, that while in persons so diseased, the most uniform symptom is one of those which have been supposed to be peculiar to, and pathognomonic of, brain-fever, viz. the general unsteadiness of the muscular motions and the trembling motion of the arms, wrists, and hands, it is impossible to resist the inference, that this unsteadiness is the effect of the morbid state of the circulation of the brain and spinal chord, and perhaps also the nerves. This symptom is not observed only in habitual spirit-drinkers, whose whole persons are impregnated with the spirituous material, and in whose blood-vessels it may be inferred to have induced that congestion and stagnation which first irritates and then oppresses the brain and nervous system. These persons are called by the Americans Tremblers. Tremulousness is also sometimes observed in unhabituated or beginning spirit-drinkers, after a great or continued debauch, in which an extraordinary quantity of liquor has been taken, and may have slightly deranged the regularity of the endo-cranial circulation, and in which the derangement in the pulmonary function may have caused in the meningeal vessels the presence of an unusual quantity of blood not only unaerated, but also slightly poisoned. The state of the brain is then much the same as in the chronic asphyxia of fever, or after the respiration of small quantities of carbonic oxide.

It is also not improbable that the symptom of tremulousness is associated with the morbid state of the cerebral arteries already noticed. My reason for thinking so is, that I have generally found, in the inspection of persons who presented these tremulous motions, subarachnoid effusion, atrophy of the convolutions, and steatomatous degeneration and rigidity of the cerebral arteries.

Nor is it a valid objection to this view of the cause of this tremulousness, that it is partially or temporarily removed by

renewing the potations. As the brain has become accustomed to the state of the vessels induced by the spirit, and as the tremulousness seems in this case to be caused by the pressure of the fluid, with a diminished pressure from the blood-vessels, the spirit, by retarding the motion of the blood within the cerebral vessels, supplies by a morbid pressure the want of that which is healthy.

Another symptom occurring in the spirit-drinker, and which may illustrate the etiology of this disorder, is the idea of the presence of moths and flies in the immediate neighbourhood of the individual. This, which is a slight degree of the visual hallucinations occurring in the established disease, must be regarded as indicative of a disordered state of the circulation, either in the retina, in the optic nerves, or in the *thalami*.

From the preceding view of the operation of spirituous liquors, taken habitually and for some time, upon the human body, which is generalized from the facts observed in the living body, and their effects on the dead, I trust it may be possible to understand the etiology and pathology of the brain-fever of drunkards.

1. It appears, in the first place, from the foregoing facts and deductions, that in this fever not only are the circulation and functions of the stomach and liver deranged, but those of the lungs and brain, and its investing membranes. It appears also to be well established, that, abstracting from minute details, the general effect of the use of spirituous liquors, if habitual and excessive, is to subvert the general and just distribution of blood to the various organs and textures, to suspend and derange the natural secretions, and to interrupt nutrition, while the blood is accumulated, and stagnates in the vessels of certain internal organs, viz. the stomach, liver, lungs, and brain. This deduction is at once proved, and its effects are illustrated by the pale countenance, contracted features, cold extremities, and the incapacity to preserve the natural temperature in persons in the confirmed stage of intoxication, previous to complete insensibility. It is easy to see that the blood is not in this condition diminished in quantity. It is only not distributed generally over the skin as in the state of health, but it is accumulated in the internal organs.

2. It appears also from the facts recorded by Sutton, Armstrong, Behr, Heineken, Berndt, Töpken, Andreae, Goeden,

Leveillé, Speranza, Coates, Witteke, Carter, Ware, and Stephen, that the symptoms of methystic brain-fever are often developed after a continued fit of drinking for a series of days, in which the blood-vessels become thoroughly charged with the spirituous material, or alcoholized, as Berndt, Töpken, Andreae, Leveillé, and Siebergundi believe. In this class of cases, the same cause acts as predisposing and exciting. It is, in short, the general cause, carried to the most intense and aggravated extreme of which it is susceptible, short of extinguishing life.

3. It appears further, that, in certain circumstances, the symptoms of methystic brain-fever may ensue in persons some short time after the fit of drinking is concluded, and when the individuals are no longer able to continue their potations by reason of the sickness and vomiting. This circumstance, however, affords no reason to infer that the appearance of the symptoms was the consequence of the sudden interruption. The cause of these symptoms was already in operation, and would have produced them, whether the interruption had taken place or not.

4. In the early and incipient stage of methystic brain-fever, the symptoms depend on irritation of the brain. That is to say, the meningeal veins are loaded with an unusual quantity of venous blood, and the arteries with imperfectly aerated arterial blood, both charged with spirituous particles; and, as this circulates slowly, it irritates the brain, and disorders the cerebral functions,—*first*, of sensation and perception; *secondly*, of memory; *thirdly*, of fancy; and, *fourthly*, of judgment. The cerebral irritation thus induced is the great cause of the sleeplessness and restlessness, as well as of the fantastic delirium and hallucinations. In this stage of the disease, which is the *Erethismus Cerebri Abdominalis* of Töpken, the *Delirium Erethicum* of Hufeland, the *Encephalopathia* of Leveillé, the symptoms may subside spontaneously, or under the use of appropriate remedies, by the poisonous blood being eliminated, in the manner of excretions, during sleep.

If, however, the irritative action do not thus subside, if the vessels be not unloaded, and the circulation re-established, it is liable to become fixed in the form of inflammatory congestion, and to give rise to effusion of serum and other morbid products. This seems to be the *Encephalitis* of Frank and Hildenbrand, and the *Hirnentzündung* of Andreae. Even without effusion of serum, the fatal termination may take place; but this result is much more frequent in consequence of effu-

sion, subarachnoid, cerebral, and intra-ventricular. The disorder, therefore, though merely irritative in the early stage, from the unhealthy state of the blood sent to, and retained within, the cerebral vessels, becomes, at least in the latter stage, congestive, and perhaps even inflammatory. Inflammation, however, does not seem essential to its symptoms.

6. It appears further, that though in a large proportion of cases of methystic brain-fever, the functions of the stomach and liver, and indeed the whole alimentary canal, are disordered, yet there are cases in which, from the quantity of spirits drank either at one orgy or during a series of days, the gastric mucous membrane is most remarkably diseased. It is then red or brown, blood-injected or blood-shot, thickened, covered with adherent mucus, and sometimes softened. In this extreme form of the gastric or gastro-enteric lesion, however, the meningeal irritation appears, as Leveillé has well remarked, to be aggravated and complicated with symptoms of gastric inflammation. In such cases, it would be impossible, in the event of the fatal termination, to ascribe that event to the affection of the *meninges* or brain alone. The lesion of the stomach, with the consequent lesion of the pulmonary circulation, would in all probability be adequate to the effect produced.—(Vide Vol. i. p. 837.)

7. Though symptoms of methystic brain-fever be produced most usually in the manner already mentioned, yet they are occasionally seen to take place in persons under circumstances where the usual quantity of spirituous liquor has been interrupted. Cases of this kind were originally observed by the first Dr Monro, who found that the incoherence and restlessness went off by allowing the patient to resume his usual habits to a moderate extent.* In the cases already referred to, as noticed by Armstrong, Wolff, Wendt, Bruhl-Cramer, and Blake, I think it cannot be doubted that the symptoms were induced, not by the interruption in the supply of spirituous liquor, but by the general disorder of the vascular system, incident either on the injury or injuries, or on the presence of some local inflammatory disorder, *pneumonia, bronchitis, gastritis, enteritis, &c.*

8. Dupuytren described in 1819† a species of delirium taking place in 1-26th part of those who had suffered fractures or other injuries, depending on no inflammatory symptom, and

* Edinburgh Medical Essays and Observations, Vol. v. p. 491.

† Annuaire Medico-Chirurgicale des Hopitaux de Paris, 1819, p. 145, 210.

lasting from two to five days. Albers of Bremen had, in 1821, observed similar mental disorder in two cases of fracture; and Professor Witthusen had often, in the Frederic Hospital at Copenhagen, recognized similar accidental disorders occurring in persons with fractures, wounds, or contusions of the extremities. Lastly, Dr Coates states, that delirium taking place after fractures is a very frequent occurrence in the Pennsylvania Hospital; and the circumstances, under which it has been observed to take place, have led most of those who have witnessed the cases to think, that the fractures were the exciting cause of the delirium. Dr Coates, who seems unaware of the existence of the paper of M. Dupuytren, adds, that the disease was described by his brother, Dr Reynell Coates, in a course of private lectures on surgery.* By the testimony of some of these authors, the persons in whom this delirium, generally with trembling of the extremities and agitation, took place, were known to be spirit-drinkers, but in whom no symptom of methystic delirium had ever before been observed to occur. On its causes Dupuytren gives no opinion; but Leveillé thinks that the general disorder arising from the irritation of the local injury was the essential cause of these attacks of trembling and intellectual derangement; and the latter author accounts it the effect of an irritating agent which acts painfully on the contused or lacerated parts, and a reaction towards the brain, disturbing its functions. This, it may be observed, is not inconsistent with the view entertained by Dr Coates, and which I believe to be the just one, that the delirium is a mere symptom of the febrile disease, induced by the local irritation of the fracture; and which we have seen takes place equally after burns, wounds, and other injuries. It is easy to see that as a fracture, wound, or contusion in a healthy individual may cause symptomatic fever of different degrees of intensity, and even delirium for a day or two, so much the more likely is it to induce in persons, whose vascular systems have been enfeebled and rendered irritable by the abuse of spirituous stimulants, fever with delirium and tremulousness. The tremulous delirium in such individuals is merely the delirium of fever modified by the alcoholization of the system.

Even continued fever and *bronchitis* I have seen induce symptoms not to be distinguished from methystic and phantas-

* North American Med. and Surg. Journal, No. viii. Oct. 1827. P. 242.

tic delirium, save by the presence of the typhoid eruption in the former case, and the course of the disease with the intensity of the rattles in the latter. In both cases it cannot be doubted, that the fever and the bronchial disorder operate as exciting causes in predisposed individuals.

DIAGNOSIS.—Several of the circumstances already mentioned must have shown the occasional difficulty experienced in framing a just diagnosis of the characteristic symptoms of methystic brain-fever. It is so liable to take place with certain complications, that the diagnosis is not at all times a matter of unequivocal certainty. The diseases and states with which it is most liable to be confounded are acute *meningitis*, typhous fever, mania, the delirium consequent on fractures, wounds, and contusions, simple spectral illusions from disease of the brain, and lastly, drunkenness, or a fit of intoxication.

From meningeal inflammation it is always difficult to distinguish it, so much the more so, that the two affections seem to differ merely in stage and degree. In *meningitis*, however, spectral illusions are less frequent and less vivid than in methystic brain-fever.

From typhous fever it is best distinguished by the absence of the typhoid eruption, by the delirium being less continuous but more violent, and by the greater frequency of illusions.

From mania the methystic brain-fever is chiefly to be distinguished by its being more chronic, generally accompanied with illusions and also tremulousness, the last of which is rare in mania.

From the delirium consequent on fractures, wounds, burns, and other injuries, it is almost impossible to distinguish the methystic brain-fever, because, in many instances, the former appears to be a mere variety of the latter. At all events, it is manifest that the delirium occurring after the injuries now specified is merely that of symptomatic fever, modified by the constitution of the patients.

Spectral illusions are sometimes observed to take place in consequence of some morbid change in the circulation of the brain, often connected with abdominal disorder, as in the case of Nicolai, the bookseller of Berlin, in others with disease of the brain. I thought at one time that this form of spectral illusions was to be distinguished from those of methystic brain-fever, by the patient being conscious of their being illu-

sions, while in the latter disease he believed them to be real.* I have since that time, however, met with one case of the methystic brain-fever, in which the individual was quite conscious that the figures were unreal. It appears that in some cases of methystic brain-fever, a certain degree of consciousness and self-possession may be left sufficient to enable the patient to rectify, by his judgment, the illusions of sensation and the creations of fancy.

Lastly, fits of actual intoxication have been mistaken for cases of methystic brain-fever. The history, course, and termination of the symptoms will enable the accurate observer to distinguish them.

PROGNOSIS.—The termination of methystic brain-fever is always uncertain. It is more liable, however, to terminate favourably in the young, in first attacks, and in cases where there is no dynamic or organic disease of the stomach, the liver, the lungs, the heart, or the arteries, than in the aged, in second or third attacks, and where any of the organs now specified are in any mode diseased.

The sanability, therefore, of the disease is in the ratio of the circumstances now mentioned, and the means to be employed. The mortality depends much on the presence of any of the lesions now specified.

Methystic delirium is a disease of not unfrequent occurrence in the various countries of Europe, where distilled spirits are employed. In Newcastle, by the testimony of Dr Burton Pearson, it was very common; in London it had been early observed by Dr Saunders; in East Kent it was very prevalent at the beginning of the present century, from the frequency of smuggling; and in Edinburgh and Glasgow it is sufficiently frequent.

According to Heineken, Berndt, Töpken, Kriebel, Goeden, Andreae, and Siebergundi, it appears to be a very frequent distemper, especially in the north of Germany; and its chief subjects are the inferior class of the labouring population, as porters and packers about the custom-houses and warehouses, wood-cutters, turners, soldiers, and sailors.

In the United States, it appears to prevail very generally. Though there be no exact statement of the amount of the cases annually, Dr Cross, in 1831, stated it to be the result of ac-

* Edin. Med. and Surg. Journal, Vol. xlv. p. 360.

curate computation, that there were in the towns of the Union 400,000 drunkards, of whom 30,000 are annually cut off as the victims of intemperance. It is particularly prevalent in the Pennsylvania State Prison, (Coates); in the Philadelphia Alms-house, (Carter); and in the Baltimore Alms-house Infirmary, (Wright.*)

TREATMENT.—DIFFERENT THERAPEUTIC METHODS.—

Though it is not always safe to draw conclusions regarding the sanability of a disease, or the sanative influence of different remedies from the remedies employed, it may not be useless to give in the following tabular statement the results obtained by different practitioners.

	Total cases.	Mortality.	Per cent.
Dr Burton Pearson,	93	0	
Mr Maxwell,	40	0	
Dr Sutton,	22	4	18
Dr Armstrong,	16 } 42	4 } 7	16 $\frac{2}{3}$
	26 }	3 }	
Dr Snowden,	73	3	4
Mr Blake,	10	1	10

In this statement, the extraordinary circumstance is the very favourable result of the practice of Dr Pearson, Mr Maxwell, and Dr Snowden, compared with that of Dr Sutton and Dr Armstrong, and the result is chiefly doubtful in proving too much, and suggesting the inference that all the cases could not have been cases of great severity. Another inference unavoidably flowing from the same facts is, that the disease must be in many cases spontaneously curable whatever be done. It is indeed well known, that, in the lower ranks, fits of methystic delirium come on and last for a day or two, and then subside spontaneously; and Dr Coates mentions, that in the port of Philadelphia, it is common for sailors, on first leaving the scene of their frolics for a new voyage, to be affected with a degree of the disease known by the name of the horrors, and yet all these persons recover mostly under the use of strong drinks, and occasionally without any treatment whatever, under the care of the captains of the vessels. Dr Coates adds, that all the captains with whom he had conversed on this point, stated that sleep invariably preceded the return of health.

The treatment originally proposed, and so highly eulogized

* Upon an average 60 cases annually. The American Journal of the Medical Sciences, No. xi. p. 23. May 1830.

by Dr Burton Pearson and Dr Sutton, by means of opium, was modified in this country by Armstrong and Wood, and its success was questioned abroad by Heineken, Berndt, Kriebel, Andreae, and many others, and in America by Klapp, Staughton, Wright, and Baron.

The great object, as has been well observed by Pearson, Sutton, Armstrong, and Coates, is the procuring of sleep; but all are not agreed as to the efficacy of opium in all cases of the disease in producing this result. And if we consider the various forms which the disease assumes, the different ages and constitutions of the individuals attacked, with the several modes in which the symptoms may come on, and above all, the morbid states with which they may be complicated, we shall see ample reason for thinking that it is impossible to prescribe a general and uniform mode of treatment for all cases indiscriminately, and that in different cases different therapeutic methods are indicated.

It has been asserted by Sutton, Coates, and others, that, if sleep be procured, the disease invariably terminates favourably. This, however, is a mistake. I have seen patients put to sleep by means of opiates, but the moment the effect was off, the symptoms recurred, and proceeded on to the fatal termination. I have already said that I have also observed temporary amelioration of the symptoms under these and other means; yet the confusion of thought, violence, and restlessness recurred, and proceeded to stupor and mortal coma. Dr Carter also states that he has repeatedly seen patients in the Philadelphia Alms-House awake, from a long and continued sleep, as delirious as ever, and the disease, notwithstanding, proceed to a fatal termination. The same physician, and also Dr Wright of Baltimore, mention cases in which the large and repeated doses of opium had produced fatal narcotism. Two grains of opium every second hour till sleep ensue are enough. But Dr Coates and some others have carried it to the extent of eighteen and twenty grains.

In the most simple forms of methystic brain-fever, in first attacks, and in young subjects, the treatment which has been found to be most beneficial is the following.

In the first place, it is indispensable to shave the head, and apply to the scalp cloths wrung out of cold water, or even ice within a bladder.

Whenever the patient is sick and vomits, it is of much moment to exhibit immediately an emetic. Some prefer tartrate of antimony, and there are cases in which this salt, by its immediately and powerfully depressing effects on the circulation and muscular system, tends remarkably to abate the delirium, the violent and outrageous conduct, and prevent the patient from wearing himself out by incessant and preternatural muscular exertion. If it be merely wished to remove sickness, then a scruple of ipecacuan and two grains of tartrate of antimony may be given; but patients in this disease not unfrequently refuse every thing in the form of medicine, and hence it is often most convenient to dissolve four, six, or ten grains of tartrate of antimony in two, three, or four ounces of water, and exhibit one ounce or two every half-hour till sickness be produced, or the violence of the delirium be abated.

After the stomach has been emptied in the manner now mentioned, an opiate may be given with benefit; and the best plan is to give either forty, fifty, or sixty drops of the sedative liquor, or two or three grains of solid opium, and repeat this in the course of two hours if sleep or quietude do not ensue. I have found it also highly beneficial in cases of this kind to exhibit a scruple of Dover's powder, and in the course of two hours one scruple more.

If, under the means now specified, neither delirium be abated, nor sleep is produced, and if the face be flushed, the features distended, the eye injected and restless, then the most efficacious practice is to take blood from the arm to the extent of fifteen, eighteen, or twenty ounces, according to the strength of the patient, his mode of bearing the evacuation, and its effect upon the symptoms. After this evacuation an opiate, either pure (forty or fifty drops of sedative liquor), or with a little antimony, (one grain,) should be administered; and, exhibited in this manner, it very generally, if not uniformly, is followed by some sleep, after which delirium is abated or entirely removed.

One principal reason why doses of opium so large and so repeated have been given in this disease, without being followed by sleep or abatement of the restlessness and delirium, is the fact, that a high degree of irritation was still acting on the brain by the vessels of its membranes being loaded with un-aerated, spirit-charged, and slowly-moving blood, in propel-

ling which, or in changing its characters, the opium had no influence. By withdrawing this source of irritation, however, as far as is practicable, that is, by diminishing the quantity in the venous system, and allowing the vessels to contract on the rest, the vascular system both of the whole frame, and of the brain in particular, is brought into that state in which the opium is enabled to act upon it. The evacuation from the sanguiferous system tends, by diminishing accumulation, to allay irritation, and restore the equilibrium; and the opium, by determining towards the surface, and allaying any residual irritation, and procuring sleep, completes what the blood-letting alone is probably unable to accomplish.

In some instances the influence of the blood-letting is not immediately evinced; and it is only after three, four, or even six hours that the countenance loses part of its flush, the features are less distended, the eye less injected, and the pulse less tense. It is requisite for the practitioner in this state of matters to proceed with great caution and discretion. The question which he requires to propose to himself is, whether blood-letting should be repeated, or another dose of opium should be administered; and it is in certain cases a matter of extreme difficulty to determine the point. If the patient be young, strong, muscular, and plethoric, in general the easiest plan is to repeat the blood-letting, and after carrying it as far as the symptoms seem to require, or the strength of the patient seems to admit, to exhibit immediately a dose of fifty or sixty drops of the sedative liquor, or one scruple or a scruple and a half of Dover's powder.

If there be doubt as to the expediency of the general blood-letting, the next best plan is to draw blood from the head, for instance the temples, or the nape of the neck, by cupping, to the extent of ten, twelve, or sixteen ounces, which is often followed by remarkable abatement of the delirium and restlessness, and eventually by disposition to sleep. The same purpose may be accomplished by means of leeches; but in general cupping and scarifying is much better suited to patients in methystic brain-fever. In most cases I have found the general blood-letting modified according to the constitution of the patient, and the intensity of the symptoms, or the detraction by means of cupping, by far the most convenient, manageable, and effectual.

The quantity of blood requiring to be drawn, and which may be borne without injury, varies in different individuals. English physicians have seldom found it requisite to detract more than fifteen or twenty ounces at once. Dr Stephen drew in a well-marked case, with great benefit, first thirty ounces, and then after two hours fifteen ounces more. The German physicians have rarely ordered more than fifteen or eighteen ounces to be drawn. It is in the United States that this practice has been carried to the greatest extent, and conducted on the largest scale. Thus Dr Potter states, that, in young subjects, and even in patients advanced in life, but recently attacked, he has frequently bled to the amount of seventy or eighty, and several times a hundred, in three or four days. (American edition of Armstrong.) But in this respect, though the American physicians have infinite merit in proving the beneficial effects of general blood-letting in the treatment of methystic brain-fever, and showing that the dread of debility is often imaginary, the example of Professor Potter is not universally imitated. Depletion is only recommended to the extent of producing some effect on the pulse, flushed face, and restlessness; and in ordinary circumstances this is accomplished by much smaller quantities.

The great use of the general blood-letting is, that it removes most rapidly and effectually the congested state of the stomach, the liver, and the lungs, and thereby withdrawing the great sources of irritation to the brain, if it do not immediately remove or abate the symptoms, it at least places the system in the way of being most easily acted upon by the other remedies, especially opium and the cold applications to the head. It is chiefly indicated, therefore, where there are decided symptoms of the phlogistic diathesis.

Blood-letting is not required for every case of methystic brain-fever. But in no case almost is it possible to dispense with the use of cathartics. Upon almost all the hypotheses that have been formed, either of the cause of the disorder or of its concomitant symptoms, remedies which act on the villous membrane and vessels of the alimentary canal are most clearly indicated. Thus, whether we believe with Armstrong, that the liver is in a state of congestion, and that its secretions are suspended, or with Töpken, that the stomach and coeliac plexus are in a morbid state, or with Berndt, that there is abdominal

plethora, we shall in each case allow that cathartics are urgently indicated. Even the hypothesis of Dr Klapp, Dr Staughton, and Dr Baron, that the symptoms depend on gastric inflammation, does not, in this mode of applying it, preclude the use of these remedies, since in the treatment of the two former practitioners, purging was always produced, and is represented to have been beneficial; and in that of the latter, besides depletion by cupping from the epigastric and hypochondriac regions, stimulant *enemata* were employed, as the bowels were generally constipated.—(Baltimore Med. and Surg. Journal and Review, No. iii. April 1834.)

The vomiting, furred tongue, constipated state of the bowels, and the tense, full, and uneasy state of the epigastric and hypochondriac regions, are symptoms which indicate the necessity of cathartic medicines as clearly as possible. The vomiting, indeed, is often more readily allayed by freely opening the bowels than by the use of emetics; and though the tense, full, and uneasy state of the epigastric and hypochondriac regions may also indicate the expediency of the local detraction of blood, they also denote the necessity of emptying the colon and small intestines, and thereby diminishing and removing the congestion and fulness of the branches of the portal vein.

For the purposes now specified, it is of little importance what cathartics be employed, providing the effect be accomplished. The most serious difficulty consists in the fact, that the patient too frequently refuses all medicine, and hence it is difficult to cause him take purgatives in the quantity required to produce the proper results. In other instances, the vomiting prevents any of the ordinary purgatives from remaining a sufficient time on the stomach.

I have found in these circumstances, that calomel and colocynth, or aloes, with a little clove oil, to obviate the griping effect of the former, is in general the most convenient. It may be given in doses of six grains of the former with four or six of the latter, twice daily, in honey, treacle, or jelly, or formed into pills; and if the patient can be prevailed on to swallow, in the course of two hours, four or six ounces of the saline infusion of senna, it will contribute to the effectual and prompt evacuation of the intestinal tube, and manifest alleviation of the restlessness, the abatement of the delirium, and considerable diminution in the frequency, with increase in the firmness, of the pulse.

The same observation already made, as to opiates being inadequate to procure sleep, unless preceded by blood-letting, is in many instances applicable as to their inadequacy previous to effectual evacuation of the intestinal tube. It is hence of great importance to administer efficient eccoprotic medicines, so as to evacuate the bowels thoroughly previous to the exhibition of opiates. It has been indeed said by Sutton, and some others, that delaying the opiate in this manner is injurious, and has in some cases been followed by the fatal event. But it may be answered, that the case which terminates fatally in this manner could not have had another termination under the use of opiates.

In the majority of cases, the most judicious plan is to combine the two orders of remedies. Thus I have found it good, after the bowels had been freely opened during the day by means of calomel and colocynth, or aloes, or the saline infusion of senna, or castor oil, to exhibit in the evening one scruple of Dover's powder, and, if sleep did not ensue in two or three hours after this, to give ten or fifteen grains more, after which in general sleep took place. Though indeed one of the most important indications be to procure sleep and abate restlessness, it is not safe to trust to opium alone for this purpose. Cold applications to the shaven scalp, cold air, the employment of active cathartics, and warmth applied to the feet, are most powerful adjuvants.

Dr Armstrong recommended, with the view of removing hepatic congestion, the employment of calomel and opium,—a combination which had been previously employed with beneficial results by Mr Gregson of Sunderland. It appears assuredly, in every view of the pathological state of the different organs in methystic brain-fever, a more judicious plan to give with the opium some agent which is likely to counteract its pure narcotic effects, than to give that drug alone; and there is no doubt, that, in many cases, either calomel or tartrate of antimony may be given with benefit. Two or three grains of calomel, with one grain or one grain and a-half of opium, may be given every six or eight hours, (Armstrong,) until quietude take place, or delirium be abated, or the skin become generally moist, and the bowels are opened. In the use of this remedy ptyalism is not only unnecessary but injurious; and to obviate its occurrence after the violence of the delirium is abated, and the patient is disposed to sleep, the bowels should be freely

opened by means of castor oil, or the saline infusion of senna, or by purgative enemata.

In certain cases, I have found it most convenient to exhibit this combination in the form of one scruple of Dover's powder, and six grains of calomel at the hour of rest, or any time when it is conceived proper to give the former remedy; and next morning to give a fresh dose of saline infusion of senna, castor oil, or any other cathartic.

It is important, however, to know that Dr Carter of the Philadelphia Alms-house, states, that he has tried in several instances the combination of calomel and opium, though without any material advantage, and with the inconvenience often of protracting the disease and rendering the patient uncomfortable by a tedious sore mouth.

Next to the abatement of the meningeal congestion and cerebral irritation, with the restoration of the circulation and secretions of the alimentary canal to their natural state, the most important point is the equalization of the circulation of the skin and the restoration of its secretions. In methystic brain-fever, as in many meningeal affections, while the skin of the head and neck is hot and perspiring, that of the extremities is cold and dry. In general, as the meningeal irritation is diminished and subsides, and as the circulation of the liver and alimentary villous membrane returns to its natural state, as the blood which had been accumulated in the internal organs resumes its natural channels, the extremities become warm, and at length moist, general diaphoresis takes place, and at the same time the head becomes cooler, and the cutaneous excretion there falls to its normal quantity.

Though these effects naturally proceed from the influence of the remedies already mentioned on the disorder, auxiliary measures with the same object may be employed. Cold applications to the head have been already mentioned as of great benefit; and to these may be conjoined the occasional use of the cold affusion upon the head, which sometimes diminishes, in a remarkable degree, the raving and violence.

With the same object Dr Armstrong recommended the tepid saline affusion three or four times in the course of twenty-four hours, after suitable evacuation of the bowels. The mode of accomplishing this is by pouring upon the whole surface two or three gallons of tepid water strongly charged with salt, and

rubbing the surface dry with warm cloths, for the purpose of drying. Dr Armstrong advises warm flannels; but if he had seen the operation performed more than once, he would have said that a good linen or flax towel, not particularly fine, would have better answered the purpose both of drying and slightly exciting the skin and its circulation.

Dr Wright again, without being aware of the method practised by Dr Armstrong, strenuously recommends for the same object the use of the tepid or rather the warm-bath, that is, immersion in a bath at 90° for a period to be regulated by its effects on the strength of the patient and the symptoms of the distemper. It was chiefly employed by this gentleman after the administration of emetics, nauseating remedies, cathartics and saline medicines, had failed to abate the intensity of the raving and violence, or to induce some degree of quietude. After removal from the bath an opiate was given, either liquid or solid, *e. g.* Dover's powder or pure opium, the last of which was given in the dose of one grain every second or third hour, while the agitation and raving lasted, which rarely went beyond three or at most four doses. Providing this extent of opiate medicine failed to induce quietude or sleep, the patient was again placed in the warm-bath, and after removal, the opiate was again resumed, but in half the dose or even less, if the patient seemed feeble and disposed to sleep. According to Dr Wright, the second employment of the warm-bath, succeeded by the diminished doses of the opiate, produced a marked hypnotic influence, and at length induced sleep, from which the patient awoke with all the symptoms of the disorder on the decline.

It is sometimes not easy to procure a warm-bath, and difficult to persuade the methystic patient to enter it. In either case it is highly important, as a hypnotic measure, to foment the lower extremities with cloths wrung out of hot salt water, or to immerse the feet and lower extremities in hot salt water.

Camphor has been mentioned in the treatment of this disease by several American physicians, sometimes alone, sometimes combined with opium. It is a good sedative in affections of the brain, and when united with opium counteracts the pure narcotic effects of the latter drug. I have employed it both with opium in the acute stage of methystic brain-fever, and with extract of henbane in the chronic form of the distemper. From five to ten grains may be given three or four times daily, with half a grain or one of opium, or three, four,

or five grains of extract of henbane. Its great use in union with opium is, that it renders smaller quantities of that drug requisite to induce quietude and sleep.

Extract and tincture of hops (*Humulus lupulus*) has been also employed as a sedative in the treatment of methystic brain-fever. It has little hypnotic power; but may be used where there are idiosyncrasies as to opium.

Cob-web, or the web of the black spider, was recommended and used in the treatment of methystic brain-fever, first by Dr Staughton, and afterwards by Dr Wright, according to the report of both with beneficial effects. The dose is from five to ten grains every hour till sleep or quietude be induced. If it really be possessed of any physiological or therapeutic influence, its great advantage will consist in enabling the practitioner to employ smaller quantities of opium.

Blisters have little or no influence on the acute stage of the disease, and in many cases seem to aggravate its symptoms. In the chronic form they are more serviceable.

Wine, spirits, porter, and other stimulant substances have been given by several, under the idea of supporting the strength, or that of the disease being supposed to be induced by the sudden abstraction of spirituous liquors in those habituated to their use, and also in the fancy, that all sudden interruptions of habits of this kind are detrimental and unsafe. There are certainly some cases of persons much advanced in life or otherwise debilitated, where it may be expedient to allow small quantities of wine and water, or even spirits diluted with water, in order to enable them the more easily to bear the requisite evacuation by antimonials and cathartics.

In the same class of cases also the powers of the circulation are so feeble, that while the means for diverting the current of blood from the oppressed or irritated organs are employed, the heart has scarcely strength sufficient to propel the residual portion in the legitimate direction. The practitioner, however, should beware of listening too much to this doctrine; and if he wish to prolong his patient's life, he will not allow himself to be influenced by the apprehensions of debility and collapse, in recommending, or even permitting, the use of vinous or spirituous stimulants.

In the case of first, or even second or third attacks, in young or middle-aged robust persons, and in whom the delirium and

speaking are incessant, the restlessness and agitation violent, the face flushed, the eye red, or even turbid and watery, and the scalp hot, with or without tremulousness, spirituous liquors or wine should on no account be given, as they invariably aggravate these symptoms, prolong the duration of the attack, and not unfrequently precipitate the fatal termination by increasing congestion, and inducing effusion. The least injurious result of the exhibition of these stimulants is to counteract the operation of the other remedies.

I am not unaware that some physicians and surgeons in this country defend this practice, and maintain that it is indispensable to the recovery of the patient. Without attempting to oppose to the imagined results of their observation my own experience, which, like that of every individual, cannot be extensive, I think it may be more satisfactory to show the error and fallaciousness of this mode of treatment from the experience of the American practitioners, which is incomparably more extensive than that of the practitioners of any European country whatever.

The whole of these gentlemen, with scarcely any exception, whatever be their differences in pathological views and therapeutic measures in other respects, concur in condemning the employment of spirituous or vinous stimulants in any form for the removal of the symptoms of brain-fever. Whether they regard the disease as a nervous disorder, a meningeal inflammation, a gastric or gastro-enteric disorder,—whether they deplete or administer opiates, or give emetics or cathartics, or employ cold affusion or the warm bath,—they all concur in denouncing, as a most pernicious practice, the administration of spirituous liquors.

Dr Klapp first showed that these stimuli were totally unnecessary, and that a great majority of patients recover without them. Since the publication of his papers the same observation has been repeatedly made by the most eminent physicians of the United States.

Thus, Dr Coates states, that he has often watched carefully the effects of the more moderate doses of distilled liquors which it is common to administer to such patients, and he has come to the conclusion, that they have no sensible influence at all. “They neither diminish the violence of the patient’s delirium, nor in the slightest degree increase his strength.”—“I have re-

covered," he adds, "I am confident, fifty cases, without allowing them any. This is certainly sufficient to disprove any necessity for its use." (North American Med. and Surg. Journal, viii. p. 222, 1827.)

Not less decided is the testimony of Dr Wright, who states that, though in the Baltimore Alms-house the practice was formerly to allow in some cases of the disorder small quantities of spirits diluted and sweetened, with the opiate, yet this method has been altogether abandoned. He further expresses his belief that no patient has suffered from the privation, and that even in this class of cases, in which alone it was supposed to be requisite, the indulgence was neither necessary nor judicious. He adds, in reference to cases in which spirits were employed medicinally, that his real conviction was that they gave too much rather than too little. (American Journal of the Med. Sciences, No. xi. p. 32.) To the employment of these agents Dr Cross and Dr Baron are equally opposed; and, indeed, the latter declares that, though he has seen the practice largely pursued, he disapproved of it, and never followed it.*

The only physicians by whom the practice is at present commended in the United States are Dr Carter and Dr Jackson.

If it be objected, that patients with symptoms of methystic brain-fever recover under the use of the stimulants, I must add that I have certainly seen recoveries take place under such circumstances; but I have seen a much larger proportion of deaths take place under their use. I have also seen cases in which the individual certainly became more collected, less violent, and at length quite rational; but in the course of a few days symptoms of stupor came on and proceeded to fatal coma. I am led, therefore, to infer, that the apparent recoveries when permanent, were effected not in consequence of, but in spite of, the use of spirituous or vinous liquors.

On the subject of restraint, all the most experienced physicians concur still more decidedly than on that of the administration of spirituous liquors. Dr Armstrong first showed the pernicious effects of this mode of treatment, and condemned, in as strong terms as he could, the employment of the strait-waistcoat.† The excellence of his directions as to this point has been amply confirmed by the experience of Wright, Carter, Jackson, Cross, and Baron.

* Baltimore Medical and Surgical Journal, No. iii. p. 50. April 1834.

† Edin. Med. and Surgical Journal, Vol. ix. p. 61 and 153.

From the experience of all these authorities, and, I may add, that my own observation leads me to confirm their testimony, it results, that all opposition and contradiction to patients in this complaint are decidedly injurious; that they are very likely to provoke the patient to resistance and violence; and that the strait-waistcoat too generally makes the patient struggle and exhaust his strength in efforts disproportionate to his power. It is wiser to listen to all the patient's statements, to credit, or at least, not to doubt his representations, to promise to remove, if possible, the sources of his dread and distress; and to study, by recommending quiet and compliance with the means ordered, to get him into such a condition, that he is likely to fall asleep. It is even better to allow a patient in this state to walk out in the cool air with an attendant or friend, than to lock him up in a close apartment, or secure him by ropes to the bed. In some instances I have seen a patient fall asleep by getting a person to read to him; the proper medical measures being also employed. In short, any mode of management in methystic brain-fever is better than the strait-waistcoat, and binding the patient down in bed.

To form a just idea of the propriety of treating patients in this manner, it would constitute an important subject of philosophical inquiry, to ascertain what are the principles of pathology, nay, what are the grounds of common sense, upon which patients, labouring under methystic brain-fever, are made to swallow half a bottle or a bottle of spirits in twenty-four hours, sometimes with a quantity of wine and ale at the same time, while they are firmly bound down in a strait-waistcoat, and the feet secured by the ankles to the bed. What number of the human race, it may be asked, if treated in that manner, would not be driven mad, or worked into a state of furiosity, in which violent muscular action would be succeeded by the exhaustion of death.

The treatment of delirium ensuing on fractures, wounds, and burns, is to be conducted on the same general principles. Every method of allaying local irritation, if any can be observed, should be adopted. The bowels should be freely emptied by means of cathartic medicine administered both by the mouth and by enema; and after these have operated fully, the best mode of tranquillizing the patient will be found in the use of opiates and opiate enemata. The latter mode Dupuytren found much more efficacious than administration by the stomach. Cold ap-

plications to the shaven scalp are indispensable; and even the local detraction of blood by means of cupping and leeches may be in certain cases employed with benefit. Spirituous liquors, which are too often thought requisite in this class of cases, are quite as pernicious as in the ordinary form, and ought on no account to be given, except in the form of tincture of senna in the saline infusion.

Restraint is in these cases equally injurious, and the proper method is watching by means of an attentive nurse.

D. Water of the Head; Water of the Brain; Dropsy of the Brain.

Meningitis Juniorum; *Meningitis subacuta*; *Meningitis Hydrocephalica*. *Hydrocephalus interior*, Sauv. sp. 1. *Aplexia Hydro-Cephalica*, Cullen. *Hydrocephalus internus*; *Hydrocephalus acutus*, Quin. *Phrenicula*, Rush. *Hydrencephalus*, Carmichael Smyth.

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LITERARY HISTORY.—This disease was first accurately described much about the same time by Dr Whytt, Dr Fothergill, and Dr Watson, who concurred in opinion regarding the seat of the complaint, most of its symptoms, and the extreme difficulty

of controlling it. The attention which their writings attracted, led Drs Dobson, Haygarth, and Percival to improve the treatment; but as the nature of the disease was imperfectly understood, the attempts of these physicians were not attended with much success. In the subsequent instances of the disease recorded by Mr Hooper, Dr Lettsom, and Mr Jamieson, the nature of the complaint seems to have been regarded in the same light, and most of the therapeutic measures were more or less empirical. It is only in the treatise of Dr Quin, who considered the symptoms and the effusion as the result of inflammation, that we begin to recognize clearer views and more sound pathology than had yet appeared; and shortly after, the observations of Rush and Garnett tended to illustrate and confirm the opinions of this physician. At a still latter period, the researches of Dr Cheyne added considerably to our knowledge of water in the head; and the treatises of Dr Carmichael Smyth, Mr Millman Coley, and of Dr Yeats, with various contributions of less consequence in some of the periodical publications, at length supplied the profession with an ample stock of materials to form correct views of the pathology and treatment of a disease, which is very liable to attack the young of both sexes in all European countries.

The little intercourse between this and continental countries previous to 1815, prevented any of the monographs of foreign authors from being known to the English physicians. We find, however, that the disease had given rise to several memoirs of considerable merit in various European countries. Kreysig published at Witteberg in 1800, a dissertation on the inflammatory form of the disease; in 1806, Mathey and Laennec published some instructive remarks in the *Journal of Corvisart*; and in 1809, Ducasse made some useful observations. These were followed by the *Essay of Formey* at Berlin in 1811; that of *Portenschlag* at Vienna in 1812; of *Loebelstein-Loebel* at Leipzig in 1813; the *Dissertation of Richeteau*, published at Paris in 1814; the excellent monograph of *Leopold Golis* of Vienna in 1815; a memoir by *Trafvenfelt* in the *Transactions of the Swedish Academy*, the same year; and a paper by *Henne* in *Hufeland's Journal* for June 1816. In the whole of these essays, considerable light had been thrown on the inflammatory origin of the disorder.

In 1817, M. Coindet of Geneva published an elaborate memoir, in which he illustrated the inflammatory origin and cha-

racter of the disorder with considerable talent; a short essay, with the same object, was published in 1818 by M. Brachet; and the same year witnessed the appearance of a memoir by Regnault. These were followed by the essay of MM. Parent-Duchatelet and Martinet in 1821; that of Piorry in 1823; the researches of Senn in 1825; and the treatises of Bricheteau, Charpentier, and Dance in 1829. The whole of these authors agree in ascribing the symptoms and effusion to an inflammatory state of the cerebral membranes, or the brain itself.

Water of the brain is a disease chiefly incident to early life; and it is observed to happen more commonly to healthy, active, lively children, than to those of an opposite disposition. It has, however, been observed, both by Fothergill and Huck, in adults (*Medical Observations and Inquiries*, Vol. iv. p. 55,) of seventeen, twenty-five, and thirty years. Garnett describes a case at sixteen, and mentions one at thirteen, and another at thirty. Yeats saw cases in persons of twenty-one and twenty-three; and one of the most distinct examples of the disease which have fallen under my own observation, occurred in a stout young woman of twenty; in whom, not only the symptoms during life, but the appearances after death, put the nature of the disease beyond doubt. It is a curious fact that all these cases were females.

SEMOGRAPHY.—Dr Whytt supposed the commencement of this disease to be obscure; that its formation may occupy some months; and that, after the appearance of various urgent symptoms requiring assistance, it continues for some weeks before it terminates fatally. A different view was given by Dr Fothergill, who states, that he saw children, to all appearance healthy and active, suddenly attacked by the symptoms of the distemper, and destroyed in the course of fourteen days. He was seldom able to trace the commencement beyond three weeks. This discordance Quin attempted to explain, by suggesting the circumstance,—that the description of Whytt was derived from instances of the disease as it occurs in children, when it is gradual in approach;—while that of Fothergill was applicable to persons of more advanced age, in whom he supposed its symptoms to be more conspicuous, and its progress more rapid. He, however, admitted, that a few signs of the disease are sometimes to be observed in infants affected by it for some weeks before death; but that, in such cases, the deviation from health is at first scarcely perceptible, or is too often ascrib-

ed to other causes. Dr Cheyne, however, contends, that this is a misapprehension on the part of Dr Quin; and thinks it cannot be doubted that Fothergill formed his first description from young subjects.

It is more probable that the true explanation of this discordance is to be found in the delineation of this disease which has been given by the researches of Cheyne, Yeats, and Golis. Cheyne had remarked, that in many cases, previous to the appearance of the hydrocephalic symptoms, there is a want of alacrity, bad appetite, costiveness, and an unhealthy colour of the skin,—all indicating a disordered state of the intestinal function, and especially of the biliary secretion (45.) Yeats recognized, among what he termed the earliest symptoms of the disease, the paleness and shrinking of the features, dulness of the eye, and a coloured line below each eyelid; harshness and heat of the skin, capricious appetite, occasional thirst, with whiteness and dryness of the tongue, and unusual slowness of the bowels, with unhealthy stools, yet without change in the state of the pulse; and dwelt much on the unhealthy state indicated by these symptoms, as an antecedent to that which constitutes the hydrocephalic disease. Leopold Antony Golis, by dividing the whole train of morbid phenomena into four stages, turgescence, inflammation, effusion, and palsy, and referring to the first head those complaints which Cheyne and Yeats described as preceding the disease, evidently adopted the same views, and furnished a similar delineation of the malady; and it is therefore to these preliminary symptoms that we must look for the explanation of the different modes in which the disease may commence, and of its longer or shorter duration in different circumstances.

It may, in short, be regarded as the result of the observation of the best practical physicians, that water of the brain, or rather what I call subacute meningeal inflammation, may commence in two modes. The first, and perhaps the most ordinary, is that in which it is preceded for several days, or in some instances, for two or even three weeks, by symptoms of general bad health, with disorder of the functions of the skin and alimentary canal. Children begin to be indifferent to persons whom they love, and objects which amuse them; they lose their usual playfulness and activity, become dull, peevish, and cross, and shun light and noise; the colour of their complexion fades, the eyes wax dim, and lose their lustre; the muscles become

soft and flabby; the skin is harsh and dry; and the plumpness of figure is lost, or converted into emaciation. Food and drink are taken with little relish, or utterly disliked; the urine is scanty; the bowels are generally bound, and the matters discharged are unhealthy,—either much lighter-coloured than usual, or darker, with unchanged bile, and with much slimy matter, which is evidently morbid mucus. At the same time, puffiness and fulness over the epigastrium and umbilical region are generally observed, and pressure causes uneasiness, or even soreness. Sleep is interrupted with muttering or screaming, and fails to give the usual refreshment. Children between two and three years of age complain of giddiness on rising, and infants express the same sensation by rocking the head, becoming suddenly silent when crying, or by a momentary wildness or stupidity of look. Grown children complain of flying pains of the nape of the neck, calves of the legs, or soles of the feet. Infants express the same sensations by moving the hands to the back of the head, whining, or general agitation and restlessness.

During these symptoms, the pulse, according to Yeats, exhibits no peculiar change, either in frequency, strength, or regularity; according to Cheyne, it becomes quick, with febrile heat, and irritability at particular times of the day; and by the observation of Golis, it beats at its natural rate for a little, then a few strokes at a more frequent rate, intermitting, or giving indistinctly the seventh, ninth, sixteenth, seventeenth, or one-and-thirtieth beat. At the same time the colour changes, and the surface, which is dry and imperspirable, is the seat of alternate flushing and chills. In some instances, the little patients fall into a state like reverie or somnambulism, with unconsciousness of surrounding objects or persons, and awake from it with a deep sigh, a scream, or involuntary convulsive motion. Actual pain of the head is not very common in this stage of the complaint; and the local uneasiness consists rather in disorder or confusion of the head. Cheyne,* however, remarks, that the quickness of pulse is sometimes attended with headach; and Yeats† observes, that the scalp feels sore on being touched or rubbed. Both Cheyne and Golis‡ admit, that

* An Essay on Hydrocephalus acutus or Dropsy in the Brain, by John Cheyne, M. D. 108. P. 12. 1808.

† A Statement of the Early Symptoms which lead to the Disease, &c. by G. D. Yeats, M. D. 1823. P. 39, 24.

‡ A Treatise on the Hydrocephalus acutus, by Leopold Antony Golis, M. D. &c. P. 12, 18, and 19.

these symptoms are almost invariably attended with a tottering or faltering gait, and much unsteadiness of motion.

The duration of these symptoms varies according to the management of the child, its constitution, and other circumstances. In some it may be a few hours only, in others it may continue eight or ten days, or may be continued to the end of the second or even of the third week. They constitute the *first mode of attack of Cheyne*, the *early or first train of symptoms* of Yeats, and the *stage of turgescence* of Golis.

In the second mode either these preliminary symptoms are more rapid in progress, or are so mild that they may be overlooked, or, in short, the proper symptoms of meningeal inflammation come on suddenly. A child in the best health becomes suddenly languid, confused, and giddy, pulls violently at the nape of the neck or temples, becomes squeamish and vomits, and gives every indication by screaming, tossing the head, and shunning light and noise, of acute pain of the head. These complaints may be regarded as indicating the commencement of the proper hydrocephalic or meningitic process.

Thirdly, I have seen the disease commence suddenly, without preliminary symptoms, with an attack of convulsion and sopor.

In whatever mode the disease commences, its presence is generally attended with the following symptoms. Severe pain either in the fore-part or the crown of the head, or shooting across between the temples, or sometimes more in one side than in the other, the head being inclined to the affected side; heat of the forehead, temples, and scalp; aversion from, and intolerance of, light and sound, with very irritable pupil; screaming, grinding the teeth and picking the nose; sleeplessness, or starting in terror from short and disturbed slumber; sickness more or less constant, vomiting once or twice in the day with heat of the epigastric region. At the same time the pulse becomes very quick, and somewhat sharp; the breathing is more hurried than usual; the skin continues dry and hot; the face being occasionally flushed, or sometimes one cheek more than the other; and the bowels are obstinately bound, or, when moved by medicine, discharge either a glutinous mass with lumpy feces, or dark-green matters like chopped spinage, or frothy stools with unchanged and unhealthy bile. The epigastric region is still tender when pressed, but generally becomes less puffy, even without considerable discharge of the intestinal contents. In some instances the patient complains

of giddiness, with cloudy vision and prismatic colours; in others he has double vision, or fancies he sees objects and persons where they are not; and in others he is violently delirious. These last symptoms are known to occur in adults only, who can communicate their sufferings. Infants during this stage of the disease utter incessant sighs and complaints. In some instances the pain of the head and the disorder of the stomach alternate, the one being relieved as the other is aggravated.

As the disease advances, the symptoms are observed to undergo modification. The pain of the head seems to abate, or the patient betrays fewer symptoms of distress; a degree of lethargy or torpor succeeds the previous restlessness; the pupil begins to be dilated, the sight is impaired or becomes indistinct,—and, in some instances, complete squinting (*strabismus*) takes place; the patient is observed to lay with one or both eyes half-closed, and, when bright objects are presented, he is often insensible of their presence. At the same time the sickness and vomiting cease; the pulse becomes slower, but irregular both in number and strength; the breathing is languid; and the bowels continue bound, and almost incapable of being moved by purgative medicines.

At a still more advanced period, the heat of the head and of the skin, in general, becomes more intense; the face and cheeks are flushed and pale alternately, with occasional unhealthy sweatings; the lips are dry and cracked, and the tongue dry, foul, and brown; the patient lays motionless, or is stretched obliquely across the bed; the pulse becomes very quick, the respiration rapid, but languid; the urine and stools are retained, and afterwards passed involuntarily; squinting, double vision, or absolute blindness, with involuntary opening of the eyelids, are now remarked, if they have not previously appeared; the flesh is wasted, the power of moving the limbs is lost, and occasional ineffectual efforts to change posture, or grasp objects, generally terminate in convulsive or awkward motions; at length the pulse becomes very weak, vibratory, and so rapid that it cannot be numbered; the breathing consists merely of a succession of rapid sighs, and coma or convulsion generally terminates the life of the patient.

In certain favourable cases, on the other hand, the symptoms of the last stage may not appear. But the restlessness and constant motion of the head gradually ceasing, with subsidence of the vomiting and an open state of the bowels, the

child begins to enjoy short sleep, and gradually, though slowly, recovers his wonted sensibility and perfect health. In some cases, however, the disease even thus subsiding leaves after it a considerable degree of squinting.

In another class of cases neither the fatal termination nor complete recovery takes place. But the infant recovers a certain degree of health, with flesh and strength, yet is blind and deaf, and does not learn to speak at the usual time. In this class of cases the brain has received such a shock that the child remains in a state of idiocy for life.

Though I have in the above description adhered as closely as possible to the divisions adopted by most of the earlier, and some of the later, observers of this disease, I must warn the practitioner, that he must not in all instances expect to find the three stages enumerated by Whytt, Fothergill, and Watson, so distinct as represented by the first of these authors; nor must he look for the minute distinctions which Yeats has made, or those which Golis has attempted to establish. Nothing, indeed, is more obvious to any one who peruses the accounts of different authors, that, notwithstanding all their efforts at accuracy, many symptoms appear in any period of the disease indiscriminately. Some which belong, in one description, to the first or second, do not appear till the third, and even of the same symptoms it is not always possible to see the same state and degree. Although, for example, Whytt founded his different stages on the state of the pulse at the beginning, middle, and end of the disease, it is remarkable that scarcely two of the writers on the subject give the same account of this symptom in the same period of the complaint. Whytt, for instance, always found the pulse very quick, almost double, in the commencement, slower in the middle, and very quick about the conclusion of the disease. Fothergill says expressly, that the pulse from being regular as in health becomes irregular, and slower as the disease advances, and still slower as the pain increases, and becomes extremely quick only near the termination. Quin, again, after enumerating the early symptoms, and, among others, acute headach, states that the pulse does not suffer any material derangement, and that it is only when the headach is excruciating, the vomiting more constant, the axes of the eyes altered in direction, and the pupil dilated, that the pulse is frequent, the face flushed, and the

breathing quick. Rush, again, informs us, that he met with one case in which no preternatural slowness or intermission was ever perceived in the pulse. Lastly, though Cheyne, in describing the mode of attack, enumerates, along with unusually contracted pupil, aversion to light and headach, quick pulse and feverish heat, Yeats states expressly, that during the early symptoms, or what he terms the first train, the pulse exhibits no morbid change either in number, strength, or regularity; and only states it to be at all times quickened during the second train, while giddiness, confused vision, and prismatic colours are the prominent complaints about the head; and Golis, still more unaccountably, describes the pulse during turgescence to be natural, or with a few beats weaker or omitted, but slow, intermitting, and irregular, with weak intermediate strokes during the inflammatory stage.

Similar discordance prevails among authors regarding the state of the eyes and of vision, on which much stress has been laid. In the first stage, according to Whytt, light cannot be borne, and the approach of a candle causes complaint; in the second they squint and see objects double; in the third the eyelids lose the power of contraction, the pupil of one or both eyes ceases to contract, and remains dilated in the strongest light; and sometimes complete blindness occurs. This in general agrees with what Fothergill and Quin observed; but Rush informs us that he did not find squinting, and dilated and insensible pupil universally in this disease, yet he found one case in which blindness, and another in which double vision, took place. Cheyne places the intolerance of light in the commencement or invading period of the disease, and the dilated pupil, squinting, and imperfect or double vision in the stage along with slow pulse and general torpor. Yeats, on the other hand, places the dilated pupil and powerless eyelid in the third or last train of symptoms; and Golis, to complete this confusion, fixes the morbid sensibility, retraction of the eye and contracted pupil in the inflammatory stage, where the pulse is represented as slow, intermitting, and irregular; double vision and erring sight in the third stage; and blindness, palsy of the iris or spasmodic contraction of the pupil in the fourth or terminating scene of the disease.

The only way of explaining these discordant accounts, for it is impossible to reconcile them, is by ascribing part of them to

imperfect observation, and part to the variable and inconstant nature of the pathological process which gives rise to the symptoms. The account of the state of the pulse and of the eyes and sight given by Whytt, I am disposed to regard as the most accurate; and if others have differed from his, it is rather that they have not observed the symptoms with the same vigilance, and have not marked their transition or modification, during the progress of the disease, with the knowledge of the fact, that, in different cases, the duration of various periods may vary, than that they have made any real improvement in the semio-graphy. At the same time I agree with Cheyne in thinking, that it is unreasonable, if not gratuitous, to expect in every example the regularity which the description of this physician exhibits. It is important for the practitioner to bear in mind, that in general the symptoms appear in the manner represented above; but that they are liable to some variation according to the rapidity with which the disease proceeds, according to the constitution of the patient, according to the nature and effect of the treatment, and probably according to certain unknown varieties in the morbid process itself.

Meningeal inflammation may terminate in resolution or recovery in the first and second stage, and even according to Yeats in the beginning of the third. It may also terminate in amaurotic blindness, in deafness, fatuity, epilepsy, or partial palsy. We meet with many cases of blindness which are distinctly referable to this cause. It may also assume the chronic form. Lastly, it may terminate in death generally in the third or concluding stage; though instances are not wanting in which this event occurred at a more early period.

Its duration varies in different cases. According to Whytt it may continue from four to six weeks; according to Fothergill from fourteen days to three weeks; Watson and Quin mention examples of it fatal in twelve or thirteen days. According to the observations of Golis the shortest duration of the disease when fatal is eight days, and cases rarely terminated unfavourably after the twenty-fourth or thirtieth. Cheyne justly remarks that its duration is uncertain.

MORBID ANATOMY AND PATHOLOGY.—The history of this disease furnishes an instructive view of the progressive improvement of pathological knowledge. It was early ascertained, that, in those who died with symptoms of this disease, a clear

thin fluid was found in the lateral ventricles of the brain, below the fornix, and frequently in the middle or third and fourth ventricles. Quin and Cheyne also remarked that cases of water of the brain (*hydrocephalus*) might terminate fatally, yet without water being found in the ventricles. Whytt, looking more to the appearances disclosed by dissection, than adverting to the causes of these appearances, declared, that the immediate cause of this, as of every other kind of dropsy, was that state, in which the exhalent arteries throw out a greater quantity of fluid than the absorbent veins can take up; and, to account for this, had recourse to laxity or weakness of the brain, original or acquired, scirrhus tumour of the pituitary gland or any part which might compress the venous trunks, too thin or watery blood, and suppression or diminished secretion of urine. Fothergill, adopting similar views, suggested the rupture of a lymphatic as a probable cause of the watery effusion; but this was triumphantly refuted, by observing that lymphatics were not shown to exist in the brain. Whether this objection had much weight with the practitioners of the day, it is certain that they continued sometimes to treat the disease as if it were a dropsy, sometimes without any theory whatever.

Withering had, in 1781, asserted that it originates in inflammation (p. 296,) and that the water found in the ventricles of the brain after death is the consequence and not the cause of the illness. This notion was decidedly the most correct, in so far as all the characteristic symptoms of the disorder are now known to be referable, not to the presence of the water but to the state of vascular congestion, and consequent irritation of the brain which precedes the effusion. But the statement of Withering attracted little attention; and physicians continued to treat hydrocephalic symptoms in the usual mode. In the midst of this doubt, Dr Quin of Dublin came forward in 1790 with an ingenious essay, in which he attempted to prove "that the disease always owes its origin to a morbid accumulation of blood in the vessels of the brain, sometimes proceeding to a degree of inflammation, and generally, but not always, producing an extravasation of watery fluid before death." In proof of this opinion, he adduced cases from various authors and from his own practice; quoted several in which the vessels of the brain were remarkably turgid; and particularly remarked, that, "in most of them a degree of inflammation

had taken place, as appeared at the time of dissection, either by preternatural adhesions of the *meninges*, or by partial opacity and increased thickness of them, together with patches of inflammatory crust, (coagulable lymph.)—Quin, p. 51.

Dr Rush was led, in 1793, to adopt, from similar facts and considerations, the idea, that water of the brain in its first stage is the effect of causes, which produce a less degree of that inflammation which constitutes phrenitis, and that its second stage is the effect of a less degree of that effusion which produces serous apoplexy in adults. Quin had denied the existence of what was termed the dropsical diathesis; and Rush adopted this view from never seeing it accompanied by dropsical effusions in other parts of the body, nor general dropsy accompanied with dropsy of the brain. “No more occurs in this disease,” he judiciously remarks, “than takes place when hydrothorax follows inflammation of the lungs, or when serous effusions follow inflammation of the joints.” Dr Garnett, in 1801, was inclined to adopt the same view from the inflammatory appearance of blood drawn in cases of the disease, from the acute pain, its aggravation under the use of stimulants, and its relief by antiphlogistic remedies.

It is, however, to the researches of Cheyne chiefly that we are indebted for the most accurate information on the pathology of this disease. “Upon dissection we generally find within the cranium, the veins, particularly those of the membranes on the surface of the brain and lesions of the ventricles, gorged with dark-coloured blood; sometimes considerable adhesions between and thickening of the membranes, and minute and florid vessels upon the *pia mater*. The ventricles contain from two to six ounces of limpid serum; also fluid in a small quantity under the arachnoid coat, both above and at the base of the brain. The substance of the brain is generally soft and blanched, fimbriated, and particularly soft where it forms the ventricles. The substance of the former is often like a soft curd. In the abdomen the intestines are inflamed and constricted from spasm, and the surface of the liver of a bright red-colour, abounding in minute vessels, and sometimes extensively adhering to the *peritoneum*. In several cases the surface of the liver was studded with small white tubercles, not larger than a grain of mustard. The glands of the mesentery are often diseased, as is evinced by their enlargement, and the caseous depositions

which we find in the substance of the glands.”—Cheyne, p. 31, 32.

If we compare the symptoms of the disease with these changes after death, and bear in mind the anatomical structure of the parts within the cranium, especially that of the cerebral membranes, we shall not only understand more distinctly its pathology, but comprehend the reason of the occasional variation in symptoms. The appearances after death are of two kinds, 1st, the effects of a morbid process; and 2d, other effects resulting from these. Of the first nature are the watery effusions into the cerebral cavities, the adhesions between the membranes, and the fluid under the arachnoid coat, whether in the upper or the lower region of the organ. Of the second are the soft and blanched state of the brain, the destruction of the vault and other changes, as destruction of the lucid septum, extrusion of the walls, enlargement of the cavities, thinning of the substance of the organ, &c. all of which have been observed in hydrocephalic brains.

The morbid process which gives rise to the symptoms of water of the brain consists not in inflammation of the brain itself, as has been maintained by Frank and Charpentier, but in inflammation of the proper cerebral membrane and its serous surface, (arachnoid coat,) occupying not only the outer portion which covers the convoluted surface, but the inner also, which penetrates into the figurate surface of the brain, [*Plexus Chorooides*.] That this inflammation or morbid process, whatever it be, is not seated in the brain, may be inferred from this, that the cerebral matter has never been found primarily red or injected, or vascular, has been found softened only as a consequence of the quantity of morbid secretion, and that the proper symptoms of cerebral inflammation are wanting in almost every part of the disease. In one or two cases, sections of the hemispheres have shown numerous red points; but these, it may be remarked, are more the effect of imperfect circulation during the last hours or days of existence, than the proofs of inflammation of the cerebral substance. In the cerebral membranes, on the contrary, we find all the marks of unequivocal disease. The arachnoid surface is dry, dull, and opaque; fluid is effused beneath it; patches of lymph in some instances; the *pia mater* is very vascular, and the portion termed the choroid network loaded with vessels, and discharging a serous fluid into the ventricles.

To understand rightly the extent and course of this morbid process, it is requisite to know, that the proper cerebral membrane consists of the *pia mater*, a vascular and filamentous web, and the arachnoid, a serous or transparent pellicle, connected to it with filamentous tissue; that this membrane not only covers the outer or convoluted surface of the brain, but enters by the great cerebral fissure,—behind the middle band, and on the sides over the limbs of the brain,—and by the fourth ventricle into the figurate surface, and the cavities or ventricles thus formed; and that it forms the choroid *plexus*, the *velum interpositum*, and the small choroid *plexus* or that of the fourth ventricle. This choroid web, which is in truth the vascular or cerebral membrane of the figurate surface, equally consists of two parts,—a vascular and filamentous, corresponding to the *pia mater*, and a serous, smooth, or transparent, corresponding to the arachnoid membrane. The vascular and filamentous part adheres, by means of vessels, to the figurate surface, generally of the optic chambers, and of the vault in the case of the interposed veil (*velum interpositum*.) The same arrangement is observed in those lateral portions which descend into the postero-inferior divisions or turns of the ventricle, and cover the great hippocampus;—and in that portion which may be traced into the fourth ventricle and by the sides of the peduncles of the cerebellum. The natural result of this distribution is that, when the membrane is inflamed, and its vessels in consequence secrete watery fluid, while that from the outer division is deposited beneath the arachnoid coat, that of the inner trickles from the membrane on the figurate surface of the brain, or, according to the common language, into the ventricles, in which its effects bear a proportion to its quantity. If small, it produces little change either in the parts of the brain, or in the feelings of the patient; if copious, it raises the vault, pushes out the walls of the ventricles, enlarges their capacity and dimensions, breaks down the middle partition (*septum lucidum*), and may ultimately extend the substance of the organ, and render it so thin as to give it the appearance of a mere shell or bag, containing a considerable quantity of water.

It may be regarded as peculiarly deserving notice, why inflammation of this membrane should give rise to watery effusion, rather than to the formation of coagulable lymph or puri-

form matter. On this point I conceive it is impossible to give any other explanation, than simply to say that such is the fact. It may be indeed observed that the inflammatory process, or at least its effects, appear more in the subserous than in the serous tissue; and that the morbid process which terminates in watery effusion into the cerebral cavities is rather inflammation of the *pia mater* and its filamentous tissue, than of the arachnoid membrane. The difference is not very important, and it is unnecessary here to dwell more at length on the subject. It is certain that the vessels of the cerebral membranes are over-distended, and that this undue distension terminates in watery effusion.

SYMPTOMATOLOGY.—I have only to remark that this view of the pathology of water of the brain, or meningeal inflammation, affords a satisfactory explanation of most of the symptoms, and of the variations to which they are liable. The inflammatory process, though it may spread over the whole extent of the membrane, is seated chiefly in its lower division, which covers the base of the brain, and its inner, which enters into the cavities. The distension of the vessels of that part which covers the optic tracts and commissure gives rise to the changes in vision and in the state of the eyes. At the beginning, when this distension is merely a source of irritation, light gives pain, and the pupil and eyelids are forcibly contracted. If this distension is more considerable, or if it be unequal, which may occur at the very beginning also, the axis of the eyes will be altered, and squinting will result; or even the pupil may be dilated, and amaurotic blindness produced. These effects may take place long before water is effused into the ventricles; and the practitioner is therefore not to despair even where squinting, dilated pupil, prismatic colours, and absolute blindness have occurred.

Similar considerations apply to the state of the sense of hearing, and perhaps to many of the painful sensations which patients experience in this disease. The *portio dura*, or facial nerve, and the auditory, being intimately connected, are liable to be affected by the vascular and distended condition of the *pia mater*, precisely where they issue from the margins of the protuberance. It is easy to see how the hearing may thus be morbidly acute, and afterwards extinct, and how the patient may complain of various painful sensations about the face and neck in the commencement of meningeal inflammation.

The sensations of pain in the forehead, between the temples,

or in the hind-head, are easily understood, when it is remembered that the membrane along the base of the brain is crowded with blood-vessels, and in a state of inflammation.

Lastly, the state of the stomach, and of the motion of the heart indicated by the pulse, in the beginning, middle, and conclusion of the disease, must be ascribed to the condition of that part of the cerebral membrane which covers the annular protuberance. If this part is not affected by the vascular state of the membrane, then the natural effect is quick sharp pulse, in consequence of the local inflammation; and sickness or vomiting, in consequence of the effect on the origins of the pneumogastric nerve (*nervus vagus*,) and perhaps of the sixth pair or great sympathetic. If the membrane is so vascular as to compress somewhat the protuberance and the pneumogastric nerve, then the natural effects of local inflammation, and those of compression or abolition of nervous power, will form a struggle, in which the motions of the heart will be rendered less rapid but more irregular. As this effect may occur even in the beginning, or not long after, this circumstance may explain some of the contradictory statements regarding the pulse already noticed. With regard to its extreme rapidity at the termination, that must be referred to the same class of facts to which the rapidity and weakness of pulse in fever, injuries of the head, and apoplexy, are to be ascribed.

The conclusion is,—that this disease does not consist in dropsy of the brain, but that it is to be regarded as inflammation of the cerebral membranes, terminating sooner or later in watery effusion or secretion.

TREATMENT.—This disease first attracted attention by being almost incurable. Of twenty patients who had fallen under his observation, Dr Whytt acknowledges, that he never had been so fortunate as to cure one who had with certainty the symptoms which denote the disease; and he suspects that those who imagine they have been more successful, had mistaken another disease for this. Fothergill does not appear to have been more successful; and Watson, under whose care one case recovered, avows that he was unfortunate with more than half the number stated by Whytt. Dr Matthew Dobson appears to have been the first who thought he had succeeded in curing the disease; and, as the remedy to which the favourable view was ascribed was mercury, trial with the same remedy, and with si-

milar result, were quickly communicated by Dr John Hunter, Dr Haygarth, and Dr Percival. Cases in illustration of the effect of the same remedy were soon after published by Dr Lettsom, by Mr Mackie, by Dr Garnett, and by Mr White of Bath; and while the disease was still regarded as incurable, the only hope was placed in the sorbefacient powers of mercury. This, however, was downright empiricism; and, whatever recoveries might take place under the use of mercury, it is certain that little was to be ascribed to the views with which the remedy was administered. Mercury has no specific powers.

The truth is, that the mortality of the disease depended more on the remedies being improperly and too tardily applied, than on its natural insanability. These remedies were always applied to its effects rather than to the morbid process itself. We now know, that, as Dr Whytt anticipated, if assistance is requested, and sanative measures taken in time, meningeal inflammation may be cured, and water of the brain prevented. But it must be while inflammation is going on, and before it has terminated in effusion, that remedial measures must be taken; and it is fortunate that, according to the observations of eminent practitioners, considerable time is allowed ere these measures are quite useless. Yeats admits, that, even in the commencement of the third or last train of symptoms, treatment is not hopeless; but it is obvious that its efficacy and success will be greatly more certain in proportion as it is prompt and early adopted.

Antiphlogistic Measures.—The great object of the practitioner is to subdue the meningeal inflammation, and restore the healthy state of the skin and alimentary canal. The particular measures by which these purposes are to be effected are, blood-letting, general and local, the application of cold to the head, of blisters, and the exhibition of purgative medicines, and perhaps of diuretics.

In most cases of threatened water of the brain, blood-letting is indispensable, and should be resorted to without delay. An infant of one year may be blooded by six, eight, or twelve leeches applied to the temples or to the nape of the neck. A child of two years may lose five or six ounces by the arm, or may be treated with leeches, according to circumstances and symptoms. In children of three, four, or five years, it will in general be requisite to commence by taking six or eight ounces

of blood from the arm; and if the pain of the head and intolerance of light are not removed, or at least diminished by this, leeches may be applied to aid its effect. In the treatment of grown up persons, or adults beyond fourteen, it will generally be requisite to detract at least fourteen or fifteen, perhaps in many cases twenty, ounces of blood, before much effect on the symptoms will be produced. The effect of this evacuation is to diminish not only the pain of the head and of the eyes, but to remove sickness, and suspend vomiting, and relax the skin. It is the most powerful and indispensable remedy for removing symptoms of water of the brain.

Next to blood-letting, the application of cold to the head is of signal use in diminishing pain, morbid heat, and sensibility. Cloths wet in cold spring-water, applied from time to time, pounded ice, or snow, may be used; or, if these cannot be easily obtained, mixtures of vinegar and water, solutions of sal-ammoniac (*urias ammoniae*,) or of salt-petre (nitrate of potass,) may be used. The scalp must be shaved.

Revellents.—Blisters have long been recommended and employed in the treatment of this disease, with the view of exciting absorption; but their effect is ambiguous. In some instances irritation applied to the scalp will augment an irritation existing within, or may create one; and it is only when it induces a counter-action, or tends to transfer the morbid process from its original site to the part blistered, that it can be useful. We can never be certain that we shall succeed in accomplishing this purpose; and almost every blister must be regarded as a mere tentative measure. It will, however, more probably transfer a morbid action, if used after previous bleeding than before; and, indeed, it is best never to order a blister without previously practising venesection, or at least a copious local bleeding. The best situation for its application is the hind-head, or nape of the neck.

Similar in effect are caustics, which have been proposed by various authors. Liable to similar objections and the same restrictions, they are further too slow in operation to be generally depended on. Where the long duration and obstinacy of the symptoms appear to indicate their use, they may be used at the hind-head, or nape of the neck, but should not be applied to any part where the subsequent ulceration may affect the pericranium.

Cathartics.—In subduing meningeal inflammation, no sort

of treatment is more requisite, or attended with better effects, than that which acts on the alimentary canal. The mucous surface is much disordered, the secretions diminished and unhealthy, the muscular fibres are inactive or absolutely torpid, and the intestinal circulation is much deranged. It is difficult to say whether these circumstances are primary or secondary, —whether they are causes or effects of the disease in the head. It is certain that inattention to the regular and periodical evacuation of the intestinal canal will disorder the gastro-intestinal mucous membrane, weaken the force of the muscular fibres, and disorder the general intestinal and hepatic circulation. It has also been believed, that unhealthy states of the brain or its membranes have considerable influence on the properties and actions of the alimentary canal. The sickness and vomiting which occur in this disease, as well as the torpid or inactive state of the whole canal, have been generally ascribed to the interruption or suspension of that influence which the healthy state of the brain is supposed to exercise over the digestive organs. But whether these opinions be well-founded or not, it is certain that the action of the tube is much disordered in every stage of meningeal inflammation; and it is equally certain, that in proportion as it is restored to its healthy and natural condition, the symptoms of the disease disappear, and the complaints of the patient are alleviated. It is indispensable, therefore, while the bowels are bound or slow, while the stools are lumpy and hard, or consist of unchanged bile, or of green matters like chopped vegetables, without the ordinary feculent smell or aspect, and the belly, epigastric, or umbilical region distended, to administer purgative medicines till the bowels are freely opened, and discharge natural excrements, and the tenderness of the belly disappears.

To effect this end, it is not of much consequence what cathartic be employed, providing it be continued in proper doses until the desired effect is produced. Calomel naturally presents itself as the most convenient for infants, in consequence of the small compass in which it proves efficacious,—and also because, according to some, it has a specific power in rousing the action of the intestines and liver. It has, therefore, been much and strongly recommended in this disease, both as a purgative, and as an alterative. Yeats, however, objects to this medicine alone, because, according to his observation, the bowels become more slow and torpid after its use than after

any other,—and because, with this effect, it has a tendency to augment the biliary secretion beyond the capability of expulsion. This is perhaps not a well-founded objection; but the practical inference which the author derives from it is good,—that it is best to combine with it some of the gum-resinous purgatives, and to alternate with the neutral salts. When calomel alone is chosen as the remedy, it is best exhibited along with about double its weight of sugar of anise, which generally obviates griping, and insures the steady operation of the medicine. A very effectual purgative also is aloes, either alone or with calomel, or with the usual proportions of scammony and colocynth. Yeats recommends the blue pill (*Pilula Hydrargyri*,) with the compound extract of colocynth, or with aloes, rhubarb, or scammony, twice or thrice, or even four times in twenty-four hours, in moderate doses, so as to keep the intestinal organs gradually excited. Next to these, and not less effectual, sometimes more so, is the infusion of the senna leaves, either alone or with tamarinds, or cream of tartar, or any other substance which disguises its nauseous taste. The neutral salts or castor-oil may be used in the ordinary way. In the exhibition of these medicines, the great point is to give them in small doses, and to go on with them steadily and unremittingly. When given in large doses, they are too often rejected by the stomach,—already irritable and capricious; and if they pass into the duodenum, they may excite merely a serous discharge and severe griping, without expelling the hard excrements and morbid secretions. Given, on the contrary, in small doses, and continued steadily for some time, they operate slowly and gradually, but with certainty, in expelling the morbid matters, and restoring the healthy state of the gastro-intestinal membrane. At the same time, the puffy swelling of the epigastric and umbilical region is reduced, the tenderness disappears, the skin becomes cooler and more moist, the pain of the head is relieved or removed, the urinary secretion is augmented, and, as the bowels return to their natural state, every symptom of the disease subsides or vanishes.

Diuretics.—When physicians looked more to the effects than the intimate pathological nature of this disease,—when they regarded it as a dropsy rather than an inflammatory malady, the exhibition of diuretic medicines was believed to be not only appropriate, but absolutely necessary. They were very rarely, however, attended with success, and, whatever allevia-

tion they seemed to produce, never almost cured the disease. This was only what was to be expected from exhibiting medicines to act on a symptom. It is now known that diuretics, to have any effect on this disease, must be exhibited early, so as to co-operate with the general antiphlogistic remedies in subduing the local inflammatory process. For this purpose foxglove (*Digitalis purpurea*) is perhaps better suited than any other, as it acts conjointly with blood-letting in diminishing the force and frequency of the cardiac and arterial pulsations. Two rules, applicable not only to this, but to every other diuretic, should be scrupulously observed, 1st, never to administer it without premising blood-letting, either general or local, or both; and, 2dly, not to have recourse to it unless blood-letting and the full exhibition of purgatives has been attempted, and been unsuccessful in removing the symptoms. With these restrictions, foxglove may be exhibited either in tincture or in powder, and may be continued till it produce its proper effect on the pulse and the kidneys. Meadow-saffron (*Colchicum autumnale*) has been much recommended of late years in the treatment of inflammatory disorders. Many of its properties point it out as a good remedy in controlling meningeal inflammation. It may be made to act either on the bowels or on the kidneys, or, in some instances, on the skin; and, if properly managed, it cannot be doubted that it may exercise great auxiliary powers. The vinegar, tincture, wine, or powder may be used, according to circumstances.

Mercurial Medicines.—The great reputation of mercury, administered so as to induce its constitutional effects, requires me to bestow a few words on this remedy. I have already alluded to the cures which took place under its use in the hands of Dobson, Hunter, Haygarth, Percival, and others. By these physicians it was ordered inunction till the mouth was affected, or the symptoms were alleviated, or it was given in the form of calomel by the mouth; and succeeding practitioners have imitated their practice with various success.

The publication of the cases, in which recovery took place, led to the frequent employment of mercurial medicines, in cases with hydrocephalic symptoms, with more or less confidence that a cure would be effected. These expectations, however, were almost never realized. In many cases in which the symptoms had taken place, and proceeded to some length, it was found that even under the continued employment of mercurial me-

dicines, externally and internally, it was impracticable to induce ptyalism. In other cases in which the mineral was exhibited, and was followed by this result, the symptoms did not subside, and the disease did not fail to proceed to the fatal termination. And in others, without being beneficial, its exhibition has appeared to be followed by the most pernicious effects.

Dr Warren, for example, states, that ten cases which he attended terminated fatally, though mercury, both externally and internally, was used in large quantities; and three or four grains of calomel every eight hours produced no purgative effect. Quin also relates, in his appendix, nine cases in which it was administered liberally, both by the mouth and by inunction, yet without controlling the disease. Rush acknowledges that, in all the cases in which he employed it previous to 1790, when he commenced the use of blood-letting and active purging, he was unsuccessful; and anticipates Yeats in ascribing this failure to the use of the mineral before the inflammatory action of the system was sufficiently subdued by previous evacuations. (On the Internal Dropsy of the Brain, p. 227.)

Notwithstanding these objections, several recent authors are disposed to place considerable confidence in the curative powers of this mineral. Cheyne states that he has several times observed, that, when the mercurial action was fully established, the symptoms were interrupted, and the termination of the disease, though fatal, unlike what we find in cases where mercury has not been used. The convulsions were suspended, the senses, both external and internal, restored, and the disease appeared to be checked; but the debility was such, that the vital functions languished, and the constitution had sustained so great a shock, that every effort to invigorate them was unavailing. (Cheyne, p. 100.) Yeats ascribes the want of success under the use of mercury to the neglect of exhibiting other purgative medicines, and thinks it has been unavailing only because it has been used injudiciously, and without having its action promoted by suitable previous evacuation of the intestinal tube. He, therefore, after blood-letting, general or local, or both, and the exhibition of neutral salts, so as to cleanse the bowels, recommends the exhibition of two or three grains of calomel every evening, with the view of obtaining the alterative effects of the mineral, or

changing the action of the capillaries which tends to effusion. (A Statement, p. 78, 79, 81, 98.) It cannot be doubted, that these views are so far rational, that no remedy whatever can benefit unless what moderates the local inflammation, and restores the natural state of the intestinal canal; and it is absurd to expect mercury or any other individual medicine to accomplish what must be done by several. But even under the most favourable circumstances, when all auxiliary measures have been taken, the administration of mercury in this disease demands caution and reserve. The natural property which every preparation of the mineral, and especially calomel, possesses of irritating the intestinal membrane, and rousing the action of the bowels, may be so considerable or excessive as to cause inflammation of these organs, (*enteria*;)—and that dreadful state of the system which has been termed *mercurial erethism*. “Many times,” says Golis, “I saw under those large and long-continued doses of calomel, the hydrocephalic symptoms suddenly vanish, and inflammation of the intestines arise and terminate in death. Still oftener I observed this accident from an incautious use of calomel in croup; viz. where all the frightful symptoms of this tracheal inflammation, which threatened suffocation, suddenly vanish, and *enteria* appear, pass rapidly into gangrene, and destroy the patients.”—Golis, p. 113. It can scarcely be doubted, that this fact affords the true explanation of the shock to the constitution, and the languishing of the vital functions remarked by Cheyne.

Upon the whole, the practical measures to be adopted in the treatment of meningeal inflammation, and the principles regarding the employment of mercury, may be reduced to the following aphorisms.

Therapeutic Summary.—1. Blood-letting, either general or local, is indispensable wherever there are headach, intolerance of light and sound, sleeplessness and screaming, quick or irregular sharp pulse, and general heat of skin, or heat of the head and face. It may be done either by opening a vein at the bend of the arm, or by opening the temporal artery in adults, or by applying leeches to the temples in infants.

2. Purgative medicines, exhibited so as to expel excrements and morbid secretions, and restore the healthy action of the canal, is indispensable, where the epigastric or umbilical region is swelled, tense, or tender, the bowels slow, the feces lumpy

and hard, or are oily, glossy, and like unchanged bile, or resemble dark-green chopped vegetable matter.

3. When the head is hot and painful, cloths soaked in cold water or ice-water, or vinegar and water, or other refrigerants, are beneficial.

4. Blisters, if deemed requisite, should be applied only after blood-letting and purging to considerable extent have been previously practised. Croton oil liniment may be used under the same circumstances.

5. To the energetic and seasonable use of these remedies, most cases of acute or subacute meningeal inflammation will yield. But if the evacuations have been carried as far as circumstances permit, recourse may then be had to foxglove and mercury, either conjoined or separate. The ordinary form of calomel is the most convenient.

6. Mercury is on no account to be used so as to cause salivation, or its usual constitutional effects, until the intestines have been previously thoroughly evacuated, and contain no unsound secretions.

7. Mercury must not be used, or it must be discontinued, if its use is attended with griping pains of the belly, bloody stools, tenesmus, or painful diarrhœa. In such circumstances opium or hyoscyamus may be exhibited, so as to produce sweating.

SECONDARY AND SYMPTOMATIC FORMS.—Besides the disease now described, which may be regarded as idiopathic *meningitis*, there are other forms of meningeal disorder in which the congestion and its effects are more to be regarded as symptoms than as primary lesions. In the *first* place, the arachnoid membrane is liable to assume an inflammatory state, in the course of which its surface and substance become occupied with minute tyromatous eminences or bodies called tubercular, and the presence of which is accompanied or followed by serous effusion. These bodies seem merely to consist of lymph effused in minute points, and are to be regarded as the effect sometimes of an inflammatory process, sometimes of a derangement or aberration in the nutrition and circulation of the membrane. The inflammatory process, however, is always chronic in character, and slow in progress.

For further information I refer to the work of Cruveilhier, who gives several cases. M. J. Piet, in a Thesis published in 1836, endeavours to show that the bodies described as glands or granulations of Pacchioni are true miliary tubercles, which

in a large proportion of cases cause hydrocephalic effusion in infants. This hypothesis, however, requires more ample proof.*

EFFECT OF MORBID GROWTHS.—In the *second* place, all morbid growths or tubercles, tyromatous masses and tumours, both of the brain and its membranes, induration of parts of the brain and other changes, and all changes in the texture of the cerebral arteries, as ossification, atheromatous or steatomatous degeneration, or osteo-steatomatous deposition, have the effect of deranging so much the circulation of the membranes, that they, in variable periods, induce subarachnoid congestion and infiltration, and intra-ventricular effusion,—results which may therefore be regarded as the common effect of a considerable number of diseases of the brain and its membranes. The effusion in circumstances of this kind is secondary and symptomatic; and as its presence depends upon another disorder, it is almost in every case incurable and fatal.

MENINGEAL APOPLEXY.—In the *third* place, there is a variety of subarachnoid and intraventricular cerebral effusion taking place in advanced life, and giving rise to slight paralytic symptoms, thickness of speech, and sometimes lethargy terminating in fatal *coma*. The most recent writers on this subject are M. Moulin* and M. Bosc.† I have almost invariably found it associated with a rigid state of the cerebral arteries, and sometimes connected with disease of the heart.

Pleurisy, or Inflammation of the Pleura. *Pleuritis, Pleuritis pulmonis*, Sauv. gen. 103. *Pleuropneumonia, pleuro-peripneumonia, peripneumo-pleuritis* Auctorum. Pleuresie, Pinel. Mal de Costat Spaniards. Stitch; from *es sticht mich in der seite*, German.

Vincent. Baronius De Pleuripneumonia, Libri duo, 4to. Foroliv. 1638.—J. B. Verna Princeps morborum acutorum Pleuritis. Venet. 1713.—Dan Wilh. Trilleri Commentatio de Pleuritide. Francofurti, 1740.—Giovan. Verard. Zeviani Della Pleuritide. 4to. Verona, 1761; et Dei Morbi Purulenti. Verona, 1771.—Wendt de Pleuritide apud Sandifort. Thesaur. ii.—An Essay on Fevers, &c. by John Huxham, M. D. &c. &c. London, 1757. 3d edition.—A Dissertation on Pleurisies and Peripneumonies, Chap. iv. p. 234.—Observations on the Epidemical Diseases in Minorca, from the year 1744 to 1749, &c. &c. by George Cleghorn, Lecturer of Anatomy, &c. 3d edition. London, 1768. Chapter vi. Of the Pleurisy in the year 1746, P. 261. 4th edit. 1779.—Observations on the Diseases of the Army, by Sir John Pringle, Bart.

* Dissertation sur la meningo-cephalite tuberculeuse des enfans. These de Paris, 1836. Par J. A. Piet.

† Traité etc. Description d'une Hydropisie Cerebrale particuliere aux Vieillards. Paris, 1819.

‡ Observations pour servir à l'histoire de hydrocephale aigue des Vieillards, ou apoplexie sereuse. Par M. Bosc. Archives Generales, 1830, xxii. p. 216.

&c. &c. 1st edit. Lond. 1752. 5th edit. Lond. 1765. Part iii. Chap. ii.—An Account of the Diseases which were most frequent in the British Military Hospitals in Germany, from January 1761 to March 1763, &c. &c. by Donald Monro, M. D. &c. London, 1764. Of the Pleurisy, p. 111.—The Morbid Anatomy of some of the most important parts of the Human Body, by Matthew Baillie, M. D., F. R. S., &c. 1st edit. 1795. 4th edit. 1812, London. Chapter iii. p. 50.—Histoire des Phlegmasies ou Inflammations Chroniques fondée sur de Nouvelles Observations de Clinique et d'Anatomie Pathologique, &c. &c. par F. J. V. Broussais, Doct. en Medecine. A Paris, 1808.—A Treatise on the Diseases of the Chest, in which they are described according to their anatomical characters and their diagnosis, established on a new principle, by means of acoustic instruments, with plates. Translated from the French of R. T. H. Laennec, M. D.; with a Preface and Notes, by John Forbes, M. D. &c. Lond. 1821 and 1828. P. i. B. iii.—Contributions to Morbid Anatomy. No. iv. by Andrew Duncan Jun. M. D. &c. &c. Empyema and Hydrothorax. Edin. Med. and Surg. Journal, Vol. xxviii. p. 302. Edin. 1827.—Lectures on Diseases of the Lungs, by D. Davies. London, 1834.—A Treatise on the Diagnosis and Treatment of Diseases of the Chest, Part i. by William Stokes, M. D. &c. Dublin, 1837. Section ix. p. 459.

It has been the subject of much controversy among medical persons, whether the *pleura* can be inflamed without the same process extending to the lung; and whether pleurisy can exist without peripneumony. The pathological collections of Haller and Morgagni have been supposed, by many authors, to prove the contrary, and to establish the inference,* that, though a portion of lung may be inflamed without affecting the *pleura*, it is impossible for the *pleura* ever to be affected without a similar state in the contiguous portion of lung. Cullen was of opinion that every acute inflammation begins in membranous parts; and he regarded the circumstance of the *pleura* being considerably affected in every dissection of persons dead of peripneumony, as sufficient proof that it is unnecessary to distinguish inflammation of the *pleura* from that of the pulmonic tissue. Baillie informs us, that “when the *pleura* is inflamed which covers the lungs, the substance of the latter is frequently inflamed to some depth.” (Morbid Anatomy, p. 53.) This, however, does not prove the necessity of uniting, as most practical authors have done, the history of pleurisy with that of pulmonic inflammation; otherwise we might oppose it with the authority of Donald Monro, of Laennec, Tacheron, and other recent observers. What the first of these authors has said is so much to the purpose that it should be better known than it appears to be. “Though it be true, that, when the *pleura* is inflamed, the surface of the contiguous lungs is generally in the same state; and that when the lungs are in-

* Haller, Opusc. Path. xiii. xiv. Morgagni, Ep. xxx. Pringle, 142.

flamed, the pleura is often affected ; yet, as I have frequently seen the true peripneumony without that sharp pain of the side which characterizes the pleurisy ; and upon opening the bodies of people who have died of the peripneumony, have found the lungs violently inflamed and livid, and so filled with blood as to sink in water, without the *pleura* being much diseased ; and upon opening the thorax of others who died of the pleurisy, have found the intercostal muscles and *pleura* violently inflamed with livid spots, and only a small portion of the surface of the contiguous lungs affected. I cannot help still looking upon them as distinct disorders, though they require nearly the same treatment, and are often complicated together.” * Yet it is a remarkable proof of the facility with which pleurisy and peripneumony may be confounded, and of the backward state of pathology, that this author has actually related, as instances of peripneumony, three interesting and well-marked cases of pleuritic inflammation. (p. 116, 120, &c.) Portal, in his discussion of the question, believed he had established that there was no essential difference between pleurisy and peripneumony, by adducing cases in which pungent pain of the side was felt during life, though after death the lungs were found inflamed and the *pleura* sound ; and he inferred that there was nothing to prove, that in pleurisy the *pleura* was affected without affection of the lung. †

To the nosologist who feels himself obliged to create a disease from symptoms, this distinction is perhaps of some importance ; but to the pathologist, who fixes his observation on the changes incident to the organic tissues, and connects them with the exterior signs to which they give rise, it is of no other use than merely as a fact of which he must be aware, and the value of which he will appreciate in studying the successive phenomena of any morbid process. But the point at issue is not whether the *pleura* may be inflamed without the lungs, as the nature and symptoms of inflammation of the *pleura*. Whether it be established or not, that the *pleura* is often inflamed without affecting the pulmonic substance, the name *pleurisy* must be restricted, according to the distinctions of modern pathology,

* An Account of the Diseases which were most frequent in the British Military Hospital in Germany, &c. By Donald Monro, M. D. London, 1764. P. 123.

† Memoires sur la Nature et Traitement de plusieurs maladies. Par Antoine Portal. A Paris, 1800. Tome ii. p. 54, 66.

to inflammation of the *pleura* only. In this instance I must also remark, that I understand by the term *pleura*, the serous or diaphanous membrane which lines the inner surface of the ribs and intercostal muscles, and covers the lungs and upper surface of the diaphragm, forming at the same time the outer coverings of the anterior and posterior mediastinum. I do not follow the example of Cullen in referring to this membrane the *pericardium*, the inflammation of which forms, according to the best observations, a distinct disease.

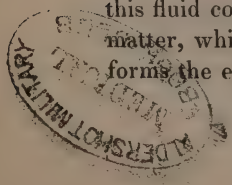
Defined in this manner, this disease may exist in every variety, from the most acute, which runs its course in five or six days, to the most chronic, which continues for weeks and months—in some instances more than a year. In the first case, the rapidity of its progress, and the violence of its effects, have made it be regarded as an acute inflammatory disease; in the second case when, either by becoming chronic, or by being originally so, it has lasted for weeks in the same or similar tenor, the symptoms, which had at first been those of symptomatic fever, are gradually converted into hectic, with its usual concomitants of wasting and loss of strength. The chronic form of pleurisy constitutes what practical authors have termed *empyema*, and in some cases *hydrothorax*; and is the malady which gives rise to certain cases of consumption, especially the dry consumption of practical authors (*phthisis sicca*). For the sake of continuity I shall describe the anatomico-pathological characters of both diseases at the same time.

ANATOMICAL CHARACTERS.—The serous membrane of the lungs, whether inflamed acutely or chronically, presents nearly the same anatomical characters. The membrane becomes of a red punctuated or dotted appearance, with minute points of a deeper red than in the acute disease, but of the same irregular figure, the spaces between of natural colour; but the membrane is also traversed by numerous vessels red or dark-coloured, but quite distinct, and not colourless as in the natural state. Many pathological observers, and among others Dr Baillie, have described the *pleura* as thickened when in a state of inflammation, and have considered this change so usual, as to be deemed a necessary consequence of the inflammatory process. This effect has been denied by M. Laennec, who informs us that he never could perceive the membrane distinctly thickened; and asserts, that the phenomenon described by these authors as *thickening*,

is either an extensive congeries of miliary tubercles on its free or adherent surface,—or a cartilaginous incrustation on the parts covered by the membrane,—or, lastly, false membranes more or less dense, adhering closely to its free surface.

The red-punctuated appearance may be regarded as the first or incipient part of the inflammatory action occurring in the pleura. It extends through its thickness, and continues as long as the disease lasts. But it never continues long without being attended with the formation and effusion of new matter from the free surface of the membrane. The first and most usual of these is the albuminous substance, forming coagulating lymph. When effused, this substance is always semifluid, viscid, of a yellowish colour, and not unlike imperfectly coagulated animal jelly. In a short time it is penetrated with vessels, shrinks or diminishes in size, becomes firmer, and acquires the vital property of exhalation. It then constitutes what has been named false membrane; and if, as frequently takes place, it is united to the corresponding part of the opposite pleura, it is termed *membrane of adhesion*, or simply *adhesion* (*concretio*; *concrementum*.)

The second species of matter formed by the inflamed pleura, is an opaque fluid of gray, or cream-like aspect, but not uniform in consistence. If allowed to stand, it separates into a thin watery fluid, which resembles green whey or milk much diluted with water, more accurately than any other thing; and a thicker matter which remains at the bottom of the vessel, and which, on examination, is found to consist of different kinds of substance, the proportions of which vary according to the duration and degree of disease. The first of the constituents of this thick substance appears to be merely the same kind of fluid as that which was decanted from it, and, when properly separated, appears to differ in nothing unless in being mixed with the other matters. The second ingredient which I shall notice is a thicker semifluid substance of minute globules or grains, which appear to float, or be mechanically suspended in the more fluid portion. This appears to be a modification of purulent matter, and may be regarded as the purulent fluid properly secreted by the inflamed pleura. The third ingredient of this fluid consists of shreds or patches of curdy or albuminous matter, which is evidently of the same nature as that which forms the exudation of the membranous adhesions.



Copious effusion compressing the Lung and causing Atrophy.—In acute pleurisy, besides the red appearance of the membrane, lymph is effused, and more rarely the sero-purulent fluid which I have described. But in the chronic disease, whether it has existed so from the beginning, or has supervened on an attack of acute inflammation, this fluid continues to be effused for a considerable time, and its presence constitutes the distinguishing pathological character of the disease. It is to be regarded as the immediate effect of the process going on in the *pleura*, and it will continue to be effused as long as this process continues. While the effusion of these morbid fluids from the *pleura* goes on, the increasing quantity breaks down whatever membranous adhesions are not sufficiently strong, and separates the lung from the inner surface of the chest, with which it had been previously in immediate contact. It thus compresses the organ more and more daily, until, when it has filled almost the whole cavity of the *pleura*, the lung is reduced to so small a size, that, on examination, it would seem to have been completely destroyed. After death, however, when the matter is removed, it will be found forced up towards the mediastinum and spine, and reduced to a very small compass indeed. In consequence of this compressed or squeezed condition, the lung becomes much smaller, its vessels are emptied, or at least the blood is prevented from filling them and moving freely through them; its bronchial tubes are crushed together, so as to prevent the admission of air beyond the first divisions; and the whole organ is rendered unfit for the purposes of respiration. If a lung which has been long subjected to this pressure be examined, it will be found not to crepitate, or at least indistinctly, to float imperfectly, and to be incapable of inflation by its bronchia, or complete injection by its vessels. This is the condition of lung so often mentioned by Broussais in his Cases, under the name of *atrophied lung*,—19, 20, 24, 25, 27, 28, 30.

In some instances of this author, the lung is also said to be reddened and hardened, or hepatized. It is easy to see that it must be impossible for a substance so light and elastic as lung to be forced into the small space mentioned in such cases, without becoming much denser, heavier, and more solid. But this state ought to be carefully distinguished from that which I have already described, when enumerating the pathological changes incident to the organ in chronic catarrh, and those yet to be mentioned as occurring in consequence of pulmonary inflam-

mation. These consist in an increased quantity of matter in the same space, without diminution of volume; in other words, by the deposition of new substance in the interstices of the old. The change of which I speak at present, consists in approximating more closely the particles of the old matter, or in forcing it to occupy a smaller space.

In the course of this process, various events may take place, which, as they are more or less intimately connected with chronic pleurisy, may be shortly noticed.

1st, Fistulous communications between the Pleura and Bronchial Tubes.—Suppurative destruction may take place in one point of the pulmonary pleura, and the corresponding part of the lung, by means of which one or more bronchial tubes are laid open, and a considerable quantity of purulent or sero-purulent fluid is discharged in certain positions by coughing. This fluid always comes up in considerable quantity, sometimes in a continuous stream, as if discharged by vomiting; but the sensations of the patient, and the distinct coughing, show that it comes through the windpipe. The time and the quantity of this discharge, will depend much on the direction of the communication between the bronchial tubes and pleura, and on the manner in which it is made. In some instances which have fallen under my observation, the capricious irregularity of its appearance was explained after death by the appearance of a sort of valvular apparatus, consisting of coagulable lymph, placed very near the pleural end of the fistula. I have reason to believe, that this is an event not uncommon in the course of chronic pleurisy; for I have seen two or three examples of it in the course of some years.*

Pneumothorax.—When chronic pleurisy terminates by a fistulous communication between the pleura and bronchial membrane, a degree of pneumothorax generally takes place, unless the lung expands with the same rapidity with which the sero-purulent fluid is discharged from the cavity. In most cases which eventually recover, membranous adhesions seem to prevent this from being so considerable as to compress the lung; and, indeed, the equality of temperature in the air which escapes, and in that which is contained in the pulmonary vesicles, ge-

* See Morgagni, Epist. XX. 6, where a good case with dissection is given. See also two examples in Barry, p. 403-406; and case 3, of Rebecca Neilson, by Dr Duncan, Edin. Med. and Surgical Journal, Vol. xxviii. p. 307; also case 8th and 10th, and two by Dr Townsend in Transact. King and Queen Cols. Vol. v. p. 145 and 484.

nerally operates as a resisting power. If the pneumothorax be considerable, it may retard, or ultimately prevent recovery. In some instances, the expanding power of the lung itself seems to force out the sero-purulent fluid, without admitting any air to the cavity of the chest.

2d, Pointing of the matter externally.—Suppurative destruction may take place in one or more points of the costal pleura, and a quantity of the sero-purulent fluid, more or less considerable, is expelled through openings between the ribs. Previous to this, in general, the effect of the effused fluid on the side becomes manifest. It becomes enlarged; the intercostal spaces become broader, and rise to a level with the ribs, or even above them. At the same time, the integuments become œdematous, and the cutaneous veins are much enlarged. This is a less frequent occurrence than the former; but several examples have been recorded by physicians, at no remote period. Dr Hunter's collection contained a preparation, in which matter had been discharged through several openings in the intercostal spaces; and I may refer for examples to the *Miscellan. Curios. sive Ephemer. Decur. III. An. V. Obs. 49. Memoirs of Med. Society, Vol. iii. p. 127.*

External Emphysema.—Not only may a fistulous opening take place between the bronchial membrane and pleura, so as to admit air into the cavity of the latter membrane, but the cellular tissue of some point of the walls of the chest may be laid open by ulceration, and, air escaping into it, may form an emphysematous swelling of more or less of the surface, with or without discharge of purulent matter. This termination is well illustrated by a case of pleurisy terminating in emphysema and consumption, described by Trever in the first volume of Thomann's *Annals*, and by a remarkable case, in which there was a fistulous communication, openings through the parietes of the chest, pneumothorax, and emphysema, described by Dr Duncan in the first volume of the *Transactions of the Medico-Chirurgical Society of Edinburgh*.

3d, Displacement of the Heart.—I have already mentioned the effect which the effused fluid produces on the size of the lung, and shown that it forcibly compresses this organ toward the spine and mediastinum. I have now to remark that, when chronic pleurisy occurs in the left side of the chest, as the quantity of sero-purulent fluid increases, it not only compresses the lung, but frequently displaces the heart so much

that the pulsations of this organ are not felt at its usual situation on the left side, but first close to the sternum, and afterwards on the right side entirely. I have met with four cases in which this change of situation had taken place, and in all it was occasioned by the great quantity of purulent fluid filling the sac of the pleura. When it occurs, it is liable to be mistaken for serious disease of the heart; but examination shows, that the change of pulsation is caused merely by forcible displacement, without change of structure of the organ.

SEMIOGRAPHY.—The symptoms which attend inflammation of the pleura, are believed to be well ascertained. This, however, is applicable chiefly to the acute disease, and the established stage of the chronic. In the former there is acute pain (*dolor pectorius*) in some part of the chest, most commonly in the side about the sixth or seventh rib, near the middle of its length or a little more forward, sometimes fixed, sometimes shooting to the shoulder-blade behind, or the clavicle before, or into the arm-pit. It is always augmented by inspiration or coughing. There is also difficulty or even pain in lying on the diseased side, difficult breathing, and generally more or less cough, which is at first dry, but may afterwards be accompanied with secretion of mucus from the mucous membrane of the bronchial tubes. The pulse is also quick, generally full, and always hard, or tense and vibrating; an infallible symptom according to the observation of Baglivi.*

The symptoms now enumerated are generally observed in well-marked cases of acute pleurisy. But it has been long remarked, that there are examples of this disease in which these symptoms do not exist, or are so obscurely marked, as to be overlooked. In examining the chest of adults after death, in which symptoms of pleurisy had never been observed, it is not uncommon to find adhesions either recent, or of some standing. To explain the appearance of these adhesions, Baillie supposed that slight inflammation may occur in the pleura sufficient to cause the secretion of lymph, yet without giving rise to pain or disturbance of the circulation. That this is possible, I am satisfied from the result of my own observation, having more than once seen cases of pleuritic inflammation, in which the pulse was not quickened, and the patient was in every respect in ordinary health, with the exception of slight pain of the side,

* *Praxeos Medicæ Lib. i. caput ix. impediment vi.*

yet when blood was drawn, it was very sizy, and much cupped, and the pulse became more frequent. A case exactly of this kind had been noticed by John Hunter, and is related by him when speaking of the want of correspondence between the rapidity of the pulse, and the existence of inflammation, as shown by the presence of pain, and the formation of buffy blood.*

More than a century ago, Baglivi made the interesting observation, that cases of pleurisy are often concealed or occult, because they are without pain, and hence give rise to serious mistakes in practice. (*Prax. Med. Lib. i.*) This form of the disease was afterwards more fully described by Maximilian Stoll, who represents it as attended with almost no quickness of pulse, with little or no inconvenience in lying on either side, rare, dry, cough, or with scanty mucous excretion, slightly white tongue, inconsiderable thirst, active appetite, and no oppression of the breast unless when under corporeal motion. "Nevertheless," says Stoll, "if this complaint be neglected, it either rises into a complete, severe, and general inflammation of the lungs, or, as oftener happens, it terminates in indurations of the pulmonic tissue, or, what is equally common, it passes into consumption."† There is no doubt that Stoll here describes the commencement of chronic pleurisy, which too often is so obscure as to elude observation, until observation is no longer useful. It is indeed a melancholy example of the difficulty and ambiguity of the art of medicine, that almost no certain signs can be given for detecting this disease in its origin. Baglivi attempted to do so, by observing the breathing in the horizontal position, and watching the changes which it underwent in laying the patient on his right side, his left side, or on his back.‡ Stoll, who must have thought this insufficient, recommends trusting most to the history of the patient and his complaints ;—whether

* Hunter, *A Treatise on the Blood, Inflammation, &c.* p. 381, 4to, Lond. 1794.

† Maximiliani Stoll, *M. D. et Prof. Pars Prima Rationis Medendi*, p. 113.

‡ "Cause the patient," says Baglivi "to lay down on the right or left side ; make him then respire strongly and cough, and after one or two respirations, interrogate him whether, during breathing or coughing, he feels pain or weight any where in the chest ; and if he affirm that he does, be assured that the seat of the pleuritic inflammation is at the spot where he pointed to the pressure or sense of weight. By the certainty of this symptom, we have detected several cases of latent pleurisy to the great interest of the patients." *Caput ix. Impedimentum vi, de pleuritide.*

he has ever before had any pleuritic or pulmonic symptoms, whether he has laboured under acute rheumatism, or rheumatic peripneumony, whether he has had catarrhal or bronchitic complaints; and lastly, whether he has symptoms of pulmonary tubercles.*

Though Stoll represents it as easy to form a diagnosis from these elements, yet is certain, that, whether from the neglect of physicians in availing themselves of them, or from ignorance and want of sagacity, it is still a difficult matter to ascertain the presence of some sorts of pleuritic inflammation.

Laennec admits, that it is not uncommon to meet with acute pleurisies in which the ordinary symptoms are wanting; and many instances of chronic pleurisy may be so indistinctly marked, and accompanied by so many dynamic anomalies, that several weeks or even months may elapse ere the true nature of the disease is suspected. Percussion indicates the disease with more certainty; for, when effusion takes place, the chest no longer emits the proper sound when struck. But as the same symptoms may occur in peripneumony, he recommends mediate auscultation by the stethoscope, as the most certain means of distinguishing the presence of pleuritic inflammation.† This, however, does not accomplish the object of the practitioner, who desires to ascertain the state of the pleura, not after fluid is effused, but previous to this event. It is not difficult with moderate attention to determine the existence of pleuritic inflammation when the membrane contains fluid; but, in the beginning of the disease, or even after several days continuance, no fluid may be effused in quantity sufficient to affect the respiratory murmur; and the practitioner, therefore, though he has recourse to mediate auscultation, is unable to say whether the pleura is inflamed or not.

In this difficulty I think there is still a resource in the vigilance and observation of the physician. I do not disguise the ambiguous nature of the disease in certain circumstances, or deny the difficulty of detecting it. If in some instances the sensibility of the pleura is so low, as not to be the source of pain when the membrane is inflamed, and the effect on the sanguiferous system so trifling as not to render the contractions of the heart more frequent than natural, it will be

* Maximiliani Stoll, &c. p. 114, 115, 116.

† Laennec by Forbes, part 2d, p. 333.

found, we conceive, that this state of quietism, if we may use such a term, does not last during a complete revolution of twenty-four hours. If the physician has any doubts about the condition of a patient whose health is not entirely perfect, who has complaints, yet without quick pulse, or pain of the side, he must examine him several times in the day, and above all about one or two in the morning. At this time, in a patient affected with inflammation of the pleura to the most trifling extent, the pulse will become at least ten, perhaps twenty beats quicker than usual, tense and full, the skin will be hot and dry, the cheeks flushed, and some pricking or uneasiness will be felt in the side. The attendant will not trust to these symptoms only; but if, upon examination, he finds this to be the state of his patient, he should have recourse to blood-letting experimentally, and as Hunter remarked, he will most probably not only find the buffy coat, but the pulse rising, as it is termed, after the evacuation. I have several times had occasion to employ this method of detecting a slow or latent attack of pleurisy, which would have quickly become either a violent acute disease, or an unmanageable chronic one. It may be desirable to use also the means recommended both by Baglivi and Stoll.

It is chiefly in its commencement that it is sometimes difficult to detect the presence of pleuritic inflammation. When effusion of lymph has taken place, or sero-purulent fluid is formed, it becomes less difficult, in consequence of its effect on the mechanical part of the process of respiration. The particular methods or contrivances to which the practitioner has recourse to ascertain these effects are, hippocratic succussion, thoracic percussion, mediate auscultation, and inspection of the thoracic motions with measurement. The first is a method somewhat rude of determining the presence of fluid only, or rather of water mixed with air. The second and third are employed to discover whether any new matter is deposited in the *pleura*, so as to prevent the chest from emitting when struck the hollow resounding noise which is heard in the natural state,—or modify the peculiar sound which the natural motion of respiration communicates to the walls of the chest; and this applies to the presence both of lymph and of purulent fluid.

1. Laennec seems to think that percussion and mediate auscultation can determine the presence of fluid only; but it is

certain that the chest will sound dull, and the respiratory murmur will disappear equally, in consequence of lymph being effused in the *pleura*, as in consequence of fluid being interposed between the lungs and the chest. When this effusion is recent, it may be so thick and abundant as to intercept completely the progress of the sonorous vibrations, until it be organized, and shrink into a false membrane. In cases of acute pleurisy, purulent or sero-purulent fluid is rarely effused in such quantity as to affect the respiratory murmur. As it is secreted or separated from the lymph, it trickles down either toward the spine and mediastinum, or toward the diaphragm, according to the position of the chest, and is rarely in such abundance as to separate the upper and convex part of the lungs from the chest. On the other hand, coagulable lymph may readily be effused all over this surface, and its presence will give rise to the same change in the sonorousness of the chest, and the same defect or absence of the respiratory murmur, as the interposition of fluid between the lungs and thoracic walls. Laennec states, in distinguishing peripneumony from pleurisy, that, “in the latter, the loss of the respiratory murmur is sudden, equable, uniform, and so complete, that no effort of inspiration can render it perceptible;—that the continuance of respiration along the spinal column is an equally constant sign,—and that this exists both in the acute and chronic disease, attended with the most copious effusion.” (Laennec by Forbes, p. 334.) Now, though he explains this phenomenon ingeniously enough, by ascribing it to compression of the lungs backwards, I think this explanation is admissible only in the case of copious effusion of purulent or sero-purulent fluid; for in cases in which this effusion is scanty, and is not interposed to prevent the respiratory murmur from being communicated, a thick coating of lymph may produce the same effect. It is further more consonant to the nature of the organic processes of the animal body, to think, that, when this murmur begins to be again perceived, it indicates in cases of acute, or subacute pleurisy at least, not the absorption of effused fluid, but the organization of lymph, and the shrinking which takes place, while it is converted into adhesions or false membranes. When fluid is effused to the extent to intercept the vibrations of the respiratory murmur, it may be removed by one or other of the processes above mentioned, p. 130; or be absorbed, as presently

explained (p. 140.) There is some reason to believe that the sound termed ægophonism or goat-voice, is caused, not as Laennec supposes, by a middling degree of effusion, but by the interposition of a layer more or less thick of coagulable lymph between the *pleura*. See Laennec's account of this phenomenon, p. 39-41 and 437-441, and of the circumstances in which it is observed to occur.

2. When effusion of serous, purulent, or sero-purulent fluid has taken place, it is in general easily recognized, either by attending to the history of the patient, and comparing it with his actual symptoms, or by practising thoracic percussion. This effusion, it has been already stated, is not common in acute pleurisy, unless about its termination, when it may occur as a consequence or effect of the inflammatory process. It is, on the contrary, very common in the chronic disease, and almost never fails to take place. In either case it constitutes what practical authors have termed *empyema*, and generally gives rise to a train of symptoms which require particular notice.

If the approach of the disease has been attended with pungent pain in the side, this either gives way entirely, or becomes dull, or is followed by a sense of weight in the side. At the same time the breathing becomes rather more difficult, and is generally more uneasy when the patient lies on the sound side. It is also more frequent, being about 28, 30, or 36 in the minute, easily accelerated, and accompanied with more or less panting. Cough is not a necessary or constant symptom, and when it is present, there is no expectoration (*tussis sicca*). The pulse becomes rather more rapid, being from 96 to 110 in adults, and from 110 to 120 or 126 in children and young persons. The skin is dry and harsh, but about the head, waist, and chest, sweats often break out. The countenance is liable to be much flushed, especially when the patient is warm in bed. At the same time the flesh is wasted apace, the strength declines, the features become contracted, and the complexion pale and sickly.

In short, if the symptoms of acute pleurisy, instead of disappearing entirely and gradually under suitable treatment, are succeeded by habitual fever, quick breathing, dry cough, emaciation and night-sweats, then it may be presumed, that purulent or sero-purulent effusion has taken place, and that the disease has passed into the chronic state.

3. But if the practitioner is still uncertain as to the nature of the disease, when attended with these rational symptoms, he may have recourse to what may be termed the sensible or critical sign. This consists in determining the presence of fluid in the cavity of the *pleura*, either by percussion, or by mediate auscultation. The first consists in tapping the chest gently with the fingers or any other firm body, when it emits, if fluid is present, a dull (*mat*) sound, like that occasioned by striking any solid part of the body; if, on the contrary, the *pleura* is in its usual state, the chest gives its natural resonance. As the dull sound, however, may be emitted, if the lungs are inflamed or solidified, or the air-cells obliterated, and as the hollow ringing sound may be emitted, if air be in the *pleura*, an event not uncommon,—this method is not quite certain.

4. On mediate auscultation, according to Laennec, more reliance may be placed; and it enables the practitioner to ascertain with precision, not only the existence, but the quantity of fluid effused. The signs obtained by the stethoscope to this effect, are, 1st, the diminution, or entire absence of the respiratory murmur; and 2d, the appearance, disappearance, and return of the goat-voice sound, or *ægophonism*. In the former case, as the effusion goes on, the murmur of respiration becomes more indistinct, first, in general, at the convex and lower part of the chest, afterwards at the upper and all over, until it is completely lost, when the difficulty of breathing, and other complaints, are generally extreme, when the fluctuation of fluid may be heard either during the patient's occasional change of position, or by moving the chest suddenly in the manner said to be practised by Hippocrates. With regard to the latter sign, I have already said that I think it more to depend on the interposition of coagulable lymph, than of fluid; and I therefore refer to Laennec for more minute information.

5. Along with percussion and mediate auscultation, it is of much moment to inspect the chest carefully, and to observe the manner in which respiration is performed. In the healthy state of the *pleura* and lungs, respiration is performed partly by the diaphragm, and partly by the intercostal muscles, elevating and rotating the ribs outwards; and the chest is seen to rise uniformly and equably on both sides, but most towards its lower circumference. When the *pleura* is inflamed, the intercostal respiration becomes instinctively less extensive and free on the

affected side, while the enlargement of the chest is performed mostly by the diaphragm. As the disease advances, this change in the manner of respiration becomes more considerable. And when much fluid is effused, and the lung is consequently compressed, the motions of the ribs are almost, if not entirely, obliterated, while respiration is performed completely by the diaphragm. Wherever, therefore, this change in the motions of the chest has taken place, it may be inferred that a considerable quantity of fluid is contained within the cavity of the *pleura*.

It is, at the same time, not uncommon to find the intercostal spaces much less distinct on an empyematous side than on a sound side, by the elevation and extrusion of the ribs by the matter; and in some exquisite cases, the affected side when measured is from one-half to three-quarters of an inch larger than the sound side.

When chronic pleurisy terminates in fistulous communication with the bronchial membrane, and gives rise to *pneumothorax*, it is indicated by the stethoscope, by the sound termed *metallic tinkling* (*Tinnitus metallicus*,) a peculiar sound closely resembling that emitted by a cup of metal, glass, or porcelain when gently struck with a pin, or into which a grain of sand is dropped, is perceived during respiration, speaking, or coughing. Laennec regards it as pathognomonic of the threefold lesion,—*empyema*, fistulous opening, and *pneumothorax*.

When chronic pleurisy is complicated with effusion of air (*pneumathorax*,) hippocratic succussion may be usefully employed. After placing the patient in a solid chair, cause his hands to be extended by an assistant, and then shake him by the shoulder, that you may hear on which side the noise takes place. (Laennec, Book iii. Ch. iv. Sect. 2 and 3.)

Cleghorn, Maximilian Stoll, and some other continental physicians, have described an epidemic pleurisy, commencing like an ague fit, and attended with bilious vomiting and purging, headach, immoderate thirst, inward heat, quick breathing, and other symptoms of intense fever. There is little doubt that this is ague complicated with pleuritic inflammation, which observes the same course, and produces the same pathological effects as the simple disease.

TERMINATIONS.—The terminations of acute and chronic pleurisy may be understood from the statements already made

regarding the different events which may take place in the course of the disease. More expressly they may be enumerated in the following order ; 1st, resolution ; 2d, in adhesion between the costal and pulmonic *pleuræ*, or between the pulmonic *pleuræ* of the lobes, in the case of interlobular pleurisy ; 3d, in death by suffocation when the effusion is very copious ; 4th, in fistulous communication with the bronchial tubes, with copious discharge at intervals of puriform or sero-purulent fluid with pneumathorax ; 5th, in spontaneous discharge of matter through the intercostal spaces, also with pneumathorax, and sometimes emphysema of the integuments ; and 6th, in absorption of the fluid matter, with consolidation of the lymph and contraction of the affected side.

The last termination, which has not yet been considered, deserves more especial notice ; since it is, next to those by resolution and adhesion, by far the most favourable termination that can take place.

It is chiefly confined to cases of chronic pleurisy, and takes place in the following manner. In cases of this class, when the effusion is very copious, as is known by the general dulness of the greater part of the side, the total absence of respiration, the confined motion or complete immobility of the ribs, the elevation and even prominence of the intercostal spaces, and the general fulness of the whole side, with the occasional enlargement and distension of the superficial veins,—after the lapse of weeks or more frequently months, the intercostal spaces become less full, and shrink first to a level with, and then below that of the ribs. In general, though the dulness upon percussion continues, there is some slight degree of respiratory murmur, and sibilant sounds begin to be obscurely heard. The shrinking of the side proceeds, and at length either affects, or seems to affect, the ribs ; for at the end of a series of months the whole side is observed to be contracted, and of smaller compass than the sound side ; and if it be measured, it is found to be from half an inch to three-fourths of an inch, or even one inch less in circumference than the sound side. At length, though the sound on percussion does not return in its original perfection, respiration is clearer, and is heard farther down than when the chest was distended with the large effusion in the height of the disorder.

At the same time there is often observed a greater degree of fulness on the sound side, a more clear sound upon percussion,

and a more intense degree of the respiratory murmur. These phenomena depend, I conceive, on the fact, that the great action of respiration is thrown upon the sound side, and not only the passive and active instruments of thoracic enlargement are instinctively obliged to perform more duty, but the lung itself is thereby roused to a greater degree of action or enlargement, and while that of the morbid side is in a state of atrophy, that of the sound is brought into a state of hypertrophy.

In the course of the external changes now mentioned, corresponding changes take place in the parts originally diseased. The serous or sero-purulent fluid gradually disappears, it is believed, by the agency of absorption. It is known, at least, that little or none is found within the *pleura*. The soft lymph is consolidated, organized, and shrinks, and is either converted into a false membrane of various degrees of thickness, or it becomes transformed into a sort of cartilaginous matter. The lung itself rises partially, so as to occupy more of the thoracic cavity than it did when the latter was filled with serous or sero-purulent fluid; but it never regains its original size, and never performs its function quite so well as before. Persons, however, may live long after this form of disorder, and enjoy a considerable degree of health and strength.

As the changes now mentioned proceed, the respiration becomes much less frequent, and eventually subsides to its ordinary rate of motion. The pulse falls to 80 or 86, and, though liable to be accelerated, sometimes descends also to its normal rapidity. Lastly, the skin begins to act regularly; the kidneys are more energetic; and the bowels are evacuated with considerable regularity without medicine. The patient recovers flesh and strength.

This is the history of those cases, either of chronic pleurisy, or of acute pleurisy become chronic, in which the disease has caused more or less copious effusion, yet without producing death by suffocation, on the intensity of the general febrile disorder, with the violence and endurance of the local irritation. Persons who have recovered from an attack of pleurisy of this kind present invariably different degrees of deformity of the chest, the side which had been the seat of the pleuritic attack being invariably smaller and contracted, generally with arctation of the intercostal spaces and impaired mobility of the ribs, while the sound side either retains its usual convexity and prominence, or acquires an additional degree of these properties.

The time occupied in the completion of the changes now mentioned varies in different individuals, and also according as the recovery is either complete or partial, permanent or temporary, and the treatment, and the season of the year. They were seldom accomplished in shorter time than four or five months, and more frequently they occupy from ten to twelve months. In the last distinct case in which I was consulted, I found the well-marked symptoms of the disease, on the 13th November 1837, on the right side, after the complaint had been going on, so far as I could learn, for ten weeks, or at least two months, *i. e.* about nine weeks. On the 13th April 1838, after an interval of 150 days, or at least five months, I learned that the side was palpably contracted, and manifestly, even to the unprofessional eye, less ample than the left, the sound side; and ten or twelve days after that respiration was becoming more audible.

DIAGNOSIS.—Pleurisy is liable to be confounded with rheumatism of the intercostal muscles and *fasciæ* (*Pleurodyne*), with various nervous and spasmodic affections of the intercostal muscles, (*neuralgia lateralis*,) pericardial inflammation, with hepatic *peritonitis*, hepatic inflammation, *splenitis*, and with common inflammation of the intercostal muscles (*myositis intercostalis*.)

From *pleurodyne* or rheumatism of the intercostal muscles and *fasciæ*, it is best distinguished by the pain not being affected by pressure, which it always is in intercostal rheumatism, by the pulse being more rapid, by the side emitting a dull sound, and by the motions of the ribs being more constrained on the affected side.

Neuralgia of the intercostal muscles occurs chiefly in nervous persons and hysterical females, and it is generally without acceleration of pulse or respiration, but connected with dyspeptic symptoms, and a tardy state of the bowels, or even the presence of worms. When the stethoscope or ear is applied to the side or back, the sound of air within the stomach and œsophagus is very distinctly heard.

It is extremely difficult to distinguish pleurisy from pericardial inflammation. The symptomatic fever is quite similar. Pleurisy is also occasionally accompanied with pericardial inflammation, and the latter is not unfrequently attended with the former. In the cases, however, in which I have had opportu-

nities of observing the two diseases, the pain was, in *pericarditis*, more strictly confined to the region of the heart, was more urgent, and extended upwards along the left margin of the sternum and beneath that bone, whereas in pleurisy it was more towards the side, and spread backwards to the spine down to the diaphragm, or upwards to the shoulders. In pleurisy also the motion of the ribs on the affected side is limited, which is not observed in pericardial inflammation; while in the latter the sense of anxiety and pericardial uneasiness, and afterwards fulness over the pericardial region, are most conspicuous. In a therapeutic point of view, the diagnosis is of little moment further than to employ in pericardial inflammation the remedial measures, if possible, with greater promptitude and energy.

Pleurisy is distinguished from hepatic *peritonitis* chiefly by the motion of the ribs being limited or annihilated, while the respiration is abdominal, whereas in hepatic peritonitis the respiration is almost entirely and exclusively thoracic.

From hepatic inflammation, or rather from its effects, namely, abscess of the liver, the diagnosis of pleurisy of the right side is extremely difficult, and the best mode in which I can show the difficulty, and suggest means for obviating it, is by mentioning what occurred to me in hospital practice this winter, 1837-1838.

I was requested to examine a young woman labouring under great difficulty of breathing and considerable pain in the lower part of the right side. I found the whole region, from the third or fourth rib downward, completely dull upon percussion, no respiration audible by the stethoscope, and little motion of the ribs on that side. Above the fourth rib percussion began to become clearer, and was good in the space between the third rib and clavicle, and there was even clear and distinct respiration, though a little sibilant. The opposite, left side, gave a good sound, respiration was also audible, though a good deal mixed with rhonchus and sibilous wheeze, and the ribs moved pretty well. Pressure at the lower part of the right side, and at the hypochondriac margins, gave much pain, and the dullness continued about one inch below the margins.

The conclusion which I drew was, that a considerable quantity of purulent fluid was situate at the lower part of the chest, compressing the lung upwards and inwards towards the spine,

and stretching the diaphragm by its weight downwards, so as to cause the pain complained of at the lower part of the chest and in the hypochondriac region; especially as the pain was manifestly occasioned by the stretching and distensive process.

Death took place in a few days; and, on inspecting the body, the liver was found to be forced upwards on the region of the chest, as far as the fourth rib, its right lobe was found to contain, or rather to be converted into, an abscess, containing five or five and a half pounds of purulent matter; and it had even encroached considerably towards the left side beyond its usual limit. The right lung was forced upwards into a space about a quarter of its usual dimensions, and though not presenting any change in its structure, by new deposition, was condensed, and in the state termed atrophy by Broussais.

To distinguish cases of this kind, nothing will suffice but correct knowledge of the history of the case, and careful observation of the right hypochondriac region. Had life been prolonged a few days more, so as to admit of a second examination, the true nature of the case might have been determined.

Pleurisy may be distinguished from *splenitis* by the greater affection of the motions of the ribs.

It is distinguished from *Myositis Intercostalis* by the pain not being affected by pressure. In the latter disorder, pressure is attended with acute pain and can scarcely be endured.

ETIOLOGY.—The causes of pleurisy, whether acute or chronic, are the same as the causes of inflammation in general. The application of cold in any form may be succeeded by the disease; perhaps the most ordinary are cold applied either to the chest, or to the feet. A cause not uncommon is being thoroughly wetted either by rain, or by accidental immersion in cold water, without afterwards removing the wet clothes.

TREATMENT.—The treatment of pleurisy varies according as the disease is acute or chronic.

In the case of acute pleurisy, the treatment is simple, and is to be conducted according to the general principles of the antiphlogistic treatment, which are sufficiently well known. They may be shortly referred to the following heads;

1st, To subdue vascular action by detraction of blood, general and local. Twenty or twenty-five ounces from the arm, once, twice, or a third time, according to circumstances, or thirty or forty ounces at a single blood-letting.

2d, To assuage the general heat and inflammatory state of the system by remedies which act on the alimentary canal; low diet, diluents, and purgatives.

3d, To lessen local irritation and morbid sensibility by counter-irritation. Blisters, irritating ointments, as the tartar-emetic ointment, or croton oil liniment, and rubefacients, as sinapisms, turpentine liniment, &c.

4th, To restore the secretions to their natural state by the exhibition of remedies which act on the skin and kidneys. Combinations of opium and antimonial medicines, opium and calomel, foxglove and calomel, with diluent medicines.

In the treatment of the chronic form, considerable modification is requisite. Most cases will require at first the antiphlogistic treatment, in the way of general blood-letting, purging, and the exhibition of foxglove, with or without calomel. If these measures relieve pain, difficult breathing, and cough, and lessen the general feverish heat, it will be sufficient to go on with the use of the foxglove and calomel, and opium may be combined in the manner employed by Beddoes. Afterwards, if pain recur, a small general bleeding, performed occasionally, or leeches applied to the chest, or cupping, or blisters, or the caustic issue will be useful. At the same time, the diet should be light and unstimulating, sufficient to afford nutriment without oppressing the stomach, or hurrying the action of the heart.

When, notwithstanding the prompt employment of all these measures, the effusion has taken place to a great extent, and respiration is rendered difficult and laborious, while wasting with fever continues, the question, whether the matter should be evacuated by an opening in the side, comes to be considered. In considering this question, it ought to be borne in mind, that in several cases of empyema, the symptoms of the presence of matter have disappeared, and the effusion has become consolidated without the discharge of the matter by puncture. In all cases in which the breathing is very difficult, while there is reason to believe that the lungs are sound, and not tuberculated, the operation of paracentesis is one which, without causing necessary danger, promises the best chance of permanent recovery. I must add, however, that my own experience of the comparative advantages of treating *empyema* by *paracentesis* or by medical measures, leads me to give the preference to the latter.

§. III. Inflammation of the Pericardium ; *Pericarditis*. *Pericardite*, Pinel.

An Inquiry into the Symptoms and Treatment of Carditis, or the Inflammation of the Heart. Illustrated by Cases and Dissections, by John Ford Davis, M. D., &c. Bath, 1808. 12mo. (These are cases of *Pericarditis* ; but the little treatise is extremely valuable.)—Observations on some of the most frequent and important Diseases of the Heart, &c. by Allan Burns. Edinburgh, 1809. 8vo. Observations on Chronic Inflammation of the Heart, p. 58.—Clinique Chirurgicale, ou Memoires et Observations de Chirurgie Clinique, et sur d'autres objets relatifs à l'Art de Guérir, par Ph. J. Pelletan, &c. Tome 3eme. Paris, 1810.—Memoire sur quelques Maladies et Vices de Conformation du Cœur, p. 127. (Extremely useful, from the account of the illness, death, and inspection of Mirabeau, with some instructive epicritical observations thereon.)—Morbid Anatomy, by Matthew Baillie, M. D., &c. London, 1812. Chapter i. p. 1.—A Treatise on the Diseases and Organic Lesions of the Heart and Great Vessels, by J. N. Corvisart, M. D. First Physician, &c. translated by C. H. Hebb, M. R. C. S. Chapter i. Article i. London, 1813.—Die Krankheiten des Herzen Systematisch bearbeitet, u. s. w. von D. Fr. L. Kreysig, Drei Theilen. Berlin, 1814–15–16–17. Zweiter Theil—Riflessioni sulla Diagnosi della Carditide e Pericarditide, par Giacomo Folchi. Bologna, 1818, e. Roma, 1819.—A Treatise on the Diseases of the Chest, &c. translated from the French of R. T. H. Laennec, M. D., by John Forbes, M. D. Lond. 1821 and 1827. P. ii. B. ii. Ch. xxiii.—Diseases of the Heart.—Memoires ou Recherches Anatomico-Pathologiques sur plusieurs Maladies, par P. Ch. A. Louis, M. D. &c. Paris, 1826. Mem. v. *sur la Pericardite*.—Delle Malattie del Cuore, loro cagioni, specie, segni e cura. Di Antonio Giuseppe Testa. Ediz. 2da, Firenze, 1823, Tom. iii. l. iii. Cap. iv. and ix. Nuova Editione, Milano, 1831. 2 vol. 8vo.—Trattato Completo di Anatomia Fisiologia e Pathologia del Cuore, par A. Schina. Torino, 1825. 4 vols. Vol. i.—An Account of the Morbid Appearances exhibited on Dissection in Disorders of the Trachea, Lungs, and Heart ; with Pathological Observations, to which a comparison of the symptoms with the morbid changes has given rise, by Thomas Mills, M. D., Hon. Fellow of King and Queen's Coll. of Phys. Dublin, 1829. iii. p. 155.—Researches on the Diagnosis of Pericarditis, by William Stokes, M. D. &c. Dublin Journal, Vol. iv. p. 29. Sept. 1833.—A Second Inquiry respecting Pericarditis or Rheumatism of the Heart ; with Cases, part of which were successfully treated in the Bath Hospital, by John Ford Davis, M. D. Senior Physician to that Institution. Bath, 1832. 12mo.—Traité Clinique des Maladies du Cœur precedé de Recherches Nouvelles sur l'Anatomie et la Physiologie de cet Organe, par J. Bouillaud, Tome i. et ii. Paris, 1834. Second Partie Classe Premiere, Liv. i. Chapitre i. De la Pericardite.—Memoire sur la Pericardite, par N. Hache. Archives Generales, ix. Paris, 1835. P. 172.—Observations on Pericarditis, by Robert Mayne. Dublin Journal, Vol. vii. p. 255. 1835.

The membranous capsule in which the heart is contained adheres below to the circumference of the tendinous centre of the diaphragm, behind to the mediastinal part of the *pleura*, and above encloses the large vessels, to which it adheres firmly. This capsule consists of two membranes, an outer and an inner, the first of which is distinctly fibrous, and seems to pos-

sess a structure analogous to the outer or cranial part of the hard membrane (*dura meninx*) of the brain. The inner is a thin transparent membrane, evidently pertaining, by all its qualities, to the order to which the *pleura* and *peritoneum* are referred. It not only covers the inner surface of the fibrous layer of the *pericardium*, and the tendinous centre of the diaphragm, but at the origin of the great vessels it is continued down toward the auricles, and ultimately over the whole outer surface of the heart. This part of it is what has been termed the *reflected* portion of the *pericardium*.—I would name it the *cardiac portion*. It differs in no respect from the proper pericardial or capsular one; but it is requisite to understand clearly this distribution or configuration of the serous or transparent membrane, in order to form a just idea of the morbid states to which it is liable.

The disease of which I am at present to treat consists in inflammation of this twofold serous or transparent membrane, and it does not appear that the outer fibrous portion has any concern in the morbid process. I shall first detail the anatomico-pathological characters of the disease, which, according to its duration and violence, has been divided into acute, subacute, and chronic. (Corvisart, Hebb's translation, p. 13 and 14.) The division of Laennec into acute and chronic is perhaps sufficient for practical purposes.

1. Inflammation of the pericardium is marked by redness of the membrane more or less deep, and some thickening in the early stage of the process, and afterwards by deposition of lymph, with serous, sero-purulent, or purulent effusion. The redness is generally slight in the acute form, and is said to be most frequently partial. It is punctuated, or irregularly clouded (*marbrée*,) or disseminated in spots; and some parts present the appearance of bloody spots very close to each other. Dr Baillie represents the membrane to become thicker and more pulpy than natural, by which its loss of elasticity and of pliancy is evidently meant. This change Dr Baillie justly ascribes to additional matter thrown into it, and perhaps into the cellular tissue between it and the fibrous part, by the overloaded state or deranged action of the minute vessels with which it is crowded. M. Laennec says he has never perceived it to be accompanied with thickening of the part. The most important circumstance to be observed is, that the membrane loses its bril-

liancy, transparency, smoothness, and pliancy, and that its free surface is dull, rough, and irregular.

2. As the inflammation advances, the free or unadherent surface of the *pericardium* begins to be covered with a layer of yellowish pulpy matter, which, as it is semifluid, seldom adheres firmly at first. It generally extends over the whole surface, and varies in thickness from that of paper, or of a wafer, to that of half-a-crown. This substance is the coagulable lymph of John Hunter, the yellow lymphatic exudation or albuminous matter of M. Corvisart, and the concrete albuminous exudation of M. Laennec. In this matter, which covers the free surface of the pericardium, there is frequently seen a slight red appearance, from small blood-vessels ramified through it, which are rendered more conspicuous by injection. They are sometimes numerous, and may be clearly traced passing from the inflamed membrane into the pulpy matter (coagulable lymph,) in which also spots of florid blood may be perceived. The exudation in this state is what Mr Hunter termed organized and organizable lymph, which denotes a more advanced stage of the process than the effusion of simple yellow lymph.

3. At a still later period of the inflammatory process, this effused lymph becomes firmer, and, as its surface is irregular, the most prominent parts of the one layer adhere to the corresponding points of the other, so as to connect the capsular to the cardiac pericardium. This forms the irregular laminated processes described by Dr Baillie, as giving the appearance of lace-work; and if the capsule be separated from the heart in this stage of the process, it will give the result noticed by Laennec, who compares it to the appearance which is produced by the sudden separation of two pieces of slab united by a pretty thick layer of butter.

4. At a still later period this disunion of the capsule from the heart will afford the calf-stomach (*caillebotée*; *bonnet de veau*) (Laennec, *Observ.* 1, 2, 3, 4, and *Artic.* II. *Obs.* 4.) surface, which must be considered as the link which connects the organizable state of the deposition with that in which it forms an adherent or connecting tissue. After this period, if the individual survive the disease, it becomes thinner, but firmer, denser, and more compact; and though many different degrees of these qualities may be noticed, yet they are all to be considered as mere varieties of what have been termed pseudo-

membranous exudation, false membrane, membrane of adhesions, or simply adhesions. In their most perfect state, after the inflammatory process has completely subsided, they appear like pieces of thick, irregular, matted serous membrane, or like what has been called cellular tissue, and, like the serous membranes, have two surfaces, an adherent, containing the vessels of the part, and a free or exhalant one. I have described, as fully as my limits admit, the characters of this deposition in different stages, because I conceive that it is want of attention to this circumstance which has caused some discrepancy in the accounts of different pathologists, and because a knowledge of its several stages and degrees is indispensable to the formation of just views on the relation between the morbid action and the external symptoms.

5. Connected with this morbid process, however, are other circumstances which have yet to be noticed. These are the effusion of serous, sero-purulent, or purulent fluid.

a. When the layer of albuminous matter (coagulable lymph) is first thrown out, a quantity, more or less considerable, of brownish or yellowish fluid is accumulated in the pericardial cavity, sometimes only a few ounces, in other instances more than a pint. The greater part of this fluid is thin and watery, and, as it resembles the serum of the blood, it has generally been considered as actually of this fluid. It may be limpid, but is generally slightly yellow, not unfrequently reddish, or tinged red, and it generally contains loose shreds of lymph or other thicker matter, which renders it somewhat turbid. This is the first variety of fluid found in the inflamed pericardium, and may be regarded as simultaneous in its appearance with the first, or the conclusion of the first stage of albuminous effusion. There are two modes in which this fluid may be formed, either directly from the inflamed membrane, or by separation from the semifluid lymph as it undergoes coagulation. There is reason to believe that the last is the manner in which it is formed.

b. The fluid effused may contain much opaque matter, or be slightly opaque and yellowish, or brownish. This forms the sero-purulent effusion, and seems to be merely a variety of the last.

c. The fluid effused may be purulent matter, more or less complete. This is rarely found without lymph, and it must

be therefore concluded, that the formation of purulent matter takes place either at the same time with that of the lymph, or subsequent to it. It is either never or rarely observed to be accompanied with ulceration or breach of surface; and the difficulty, therefore, is to determine the precise source whence this purulent effusion proceeds. Baillie thinks it extremely probable that it is derived from the small arteries, which are distributed in the layer of coagulable lymph. If it were derived, he argues, from the arteries of the inflamed membrane itself, then it must transude through a layer of coagulable lymph, often of considerable thickness, before it accumulates in the cavity, which is not likely; and, as arteries pass from the membrane into the layer of lymph, it is more reasonable to think that these are the source of the purulent fluid.

6. Lastly, Morgagni has observed numerous small abscesses to be formed in the pericardium in consequence of inflammation. Epist. xxiii.

SEMIOGRAPHY.—Such are the pathological characters of acute inflammation of the pericardium. The external signs to which they give rise, or the influence the process of inflammation exercises on the functions and actions of the living body, are exceedingly variable. Sometimes it takes place with all the symptoms of a very severe disease of the chest; in other instances it passes through its several stages, and proves fatal without betraying a single symptom of its existence; and cases have occurred, on the contrary, in which all the symptoms enumerated by authors as proper to this inflammation have appeared, yet in which no trace of the disease could be recognized after death. This difficulty was acknowledged by Corvisart, who ascribes it to the complication of *pericarditis* with pleurisy, peripneumony, or other pectoral inflammations. But it must be observed, that though this complication is frequent, it will not universally explain the obscurity of the symptoms of pericardial inflammation; and Laennec informs us, that the most complete examples of latent pericarditis with which he has met, occurred in subjects whose other thoracic organs were sound, and who died of disease of the abdomen. He concludes, therefore, that inflammation of the pericardium is sometimes a local affection of moderate violence, and possessing little influence on the system at large and on the circulation; while in other instances, it appears attended with acute fever, and

with disorder of the functions, so violent as to threaten the life of the patient.

To me it appears that some of this irregularity of phenomena and obscurity of symptoms is to be ascribed to the degree of the disease, and its being strictly confined to the *pericardium*, or spreading to the heart, great vessels, or lungs. Dr Baillie has remarked, that the symptoms cannot be distinguished in practice from those which attend inflammation of the substance of the heart. Now we have seen that pericardial inflammation affects not only the capsular, but also the cardiac portion of the membrane, and in this progress it will certainly affect both the origins of the great vessels and the auricles, and also occasionally the substance of the heart itself. It is evident, therefore, that in every case in which the inflammation attains this stage, the motions of the heart will be more or less influenced, and also in some degree those of respiration, in consequence of the affection of the great vessels and auricles. While, therefore, inflammation of the capsular pericardium will, at its commencement, or when it is not extensive, produce trifling, perhaps imperceptible disturbance in the functions, it may be presumed that, as it advances, it will be attended with more evident and severe symptoms, and in its most complete and extensive form, when it affects the cardiac pericardium, the cardiac substance, and the great vessels, will give rise to the distressing symptoms ascribed by nosologists to its presence. These are pain or sense of heat in the region of the heart, commonly, not constantly palpitation, difficult breathing, with great anguish, cough, and sometimes fainting (*syncope*), with symptomatic fever, in which the pulse is at first quick, hard, and regular, afterwards small, wiry, and irregular. These symptoms are sometimes sudden in their approach; and the patient rarely survives long after they have appeared, unless the inflammation on which they depend spontaneously ceases, or is seasonably checked.

In one case in which I saw pericardial inflammation ensue in a girl of fourteen, on rheumatism of the elbows, wrists, and ankles, and proceed in the course of eight or nine days to the fatal termination, with copious effusion of lymph within the *pericardium*, the only prominent symptoms, besides those of symptomatic fever, were constant tossing of the extremities and person (jactitation,) similar to the motions of the dance of St Vitus. A case with similar symptoms of choreiform mo-

tions, in a young girl of nine, I find occurred to Dr J. Roeser of Bartenstein, and is recorded by him in Hufeland's Journal. (lxvii. St. v. 54. Berlin, 1828.)

Folchi attaches great importance to the state of the pulse as a diagnostic symptom in *pericarditis*. According to this author, the arterial beats are not only extremely small and rather feeble, but they are so frequent as to be scarcely capable of being numbered. The pulse, according to Folchi, is as if the arterial tube collapsed immediately before it was thoroughly distended by the stream of blood, and the artery seems to oscillate or vibrate beneath the finger, to which it imparts the sensation of slight subsultus. (*Riflessioni sulla diagnosi della carditide, &c.*) The pulse is undoubtedly very generally, in *pericarditis*, small and sharp, and also frequent; but the difficulty of applying this symptom consists in the fact, that in many other inflammatory diseases it is equally frequent and equally small.

Among the symptoms conceived capable of illustrating and rectifying the diagnosis of pericardial inflammation, great importance has been attached to one of the physical signs procured by auscultation. M. Collin undertook to show that the most certain and unequivocal symptom of the presence of *pericarditis* is a sound similar to that elicited by the bending of new leather. Unfortunately, however, subsequent observation has shown, that, though this sound is occasionally heard, it is not a constant or invariable symptom, and Bouillaud allows that in the majority of cases it is wanting.

A modification of this sound, however, viz. the friction of grating sound, as if two rough or unequal surfaces were rubbing against each other, originally recognized by the same observer, is represented to be much more generally observed.

The existence of this sound in several cases of pericardial inflammation was afterwards more or less generally verified by Dr Latham, Dr Hope, Dr Stokes, and Mr Mayne; but the observations of the latter author, as well as several made by myself, lead me to attach to it less importance than has been generally assigned to it.

According to the descriptions of those who have most studied this sound, it is not in all cases the same either in kind or in degree. 1. In some instances it resembles the rough dull sound produced by rubbing two rough surfaces against

each other. In this class of cases it may be termed the grating creak; (*crepitus asper*). 2. In another class of cases it forms a grating sound, similar to that produced by rubbing several folds of new stiff leather against each other in the hand. In this class of cases it may be termed the coriaceous creaking crepitation; (*crepitus coriaceus*). 3. In a third class of cases it has a more rough, dull, rasping sound, similar to that produced by the motion of a saw or rasp; (*sonitus serrans*). 4. And in another class of cases, it seems to pass into an ordinary bellows or blowing sound, but with a slight mixture of the rasping sound.

Now, of the whole of these symptoms, it must be observed, that while it has been fully ascertained that cases of pericardial inflammation may pass through their entire course without showing any one of them, it is also certain that several of these sounds, when they do take place, are audible only at certain stages of the disorder. It is observed, for instance, that in the early stage of pericardial inflammation, while the morbid action consists in mere vascular injection, and before morbid products are effused, no grating or creaking sound is heard. It is only after either one surface or both have effused lymph that the sound is formed. Nor does it appear to be in all cases formed when lymph is effused; for if the effusion be copious and semifluid, no friction or grating sound is formed. So far as I have myself had occasion to observe cases of pericardial inflammation, I must say that it is chiefly when the lymph effused is scanty or thick, and with little fluid, that the sound is formed. When the effusion is copious, the sound is masked or obscured, and accompanied with a great degree of dulness.

It appears, then, that neither in the early stage of the disease, before effusion has taken place, nor in the last stage, when the effusion is very abundant, is the coriaceous or grating sound heard.

The third and fourth forms of the sound are so common to several different diseases of the heart, that to them, as pathognomonic signs, it is impossible to attach any importance.

When, however, either the coriaceous or grating sound is heard, or what Bouillaud terms the pericardial grazing, is audible, it affords a pretty decided proof that the natural smoothness of the free surfaces of the pericardium is destroyed, and that one or both surfaces are roughened by deposition of

lymph. It must not be forgotten, however, that auscultation in this case indicates the presence, not of a disease itself, but of the effects of a disease; and this is indeed one of the strongest objections to mere reliance on this as a diagnostic method. The business of the physician is to prevent, by prompt and appropriate treatment, this sign from being formed, not to wait until it has taken place. The same remark is applicable to the employment of percussion, as dulness only takes place after the occurrence of effusion.

The symptoms of the chronic form are involved in greater obscurity, if possible, than those of acute pericarditis. Corvisart ascribes this to the frequency of complication, either with disease of the valves, or tubercular deposition in the lungs, (p. 26,) and is satisfied that it will generally be difficult to recognize it at the bed-side of the patient. Laennec in like manner admits, that, of several cases which he had considered throughout as examples of chronic pericardial inflammation, almost all were cured; he confirmed his diagnosis by dissection in two or three cases only; but very frequently he found the membrane full of purulent matter, and in a state of chronic inflammation, when nothing led him to suspect the existence of the disease. In general, the symptoms, when they are discernible, are the same as those of the acute disease, but less violent.

The duration of *pericarditis* varies according to the severity of the inflammation, and the effects of treatment. The average duration of the acute disease appears to be from five to ten days. The most violent and dangerous symptoms appear about the third day, after which the pain generally is less severe, or ceases; the features collapse; cold shiverings, frequent faintings, and dreadful anxiety and suffocation ensue; and death generally takes place about the fifth or sixth day. (Corvisart, p. 6, 9, &c.) When life is continued beyond the tenth day, it denotes a milder disease, and may be regarded as subacute. (Corvisart, 17, 18). The chronic disease has a still longer duration, and may continue for weeks or even months. According to Corvisart, the acute and chronic are equally fatal; and lead to death with equal certainty; whereas the subacute, in his opinion, is susceptible of a favourable termination. But this industrious physician appears to have fallen into several errors on this subject, as appears by his believing every case of complete adhesion of the heart to the pericardium necessarily

attended with mortal derangement of the functions. The researches of Laennec have shown that persons have survived attacks of pericardial inflammation, in which lymph had been effused, and adhesions formed; and the same author states that cases of the chronic disease have recovered after the lapse of one or two years, when the action of the heart and pulse became natural and regular. (P. 383).

The causes of pericardial inflammation are the same as those of thoracic inflammation in general, combined with those which are observed to induce diseases of the heart. Corvisart has enumerated a long list of circumstances of the human body, which may be succeeded by the disease,—all of which may be referred to the application of cold, or any similar morbid agent, when the body is rather warm or overheated. The result of his observation further shows, that natives of warm climates, and especially Creoles, are more liable than others to the operation of these causes. It is chiefly a disease of persons arrived at the age of puberty; and we have seen instances of its occurrence shortly after that period. After this, it may occur at any time of life, but most frequently between thirty and forty years.

The presence of cardiac diseases, however, and whatever tends to induce cardiac diseases, are the most prolific source of pericardial inflammation. Among these may be placed in the first rank various mental emotions, and the physical excitement consequent upon their indulgence and gratification. Thus it is justly observed by Pelletan, that not merely excess in the pleasures of the table, but the indulgence of the sexual passion are frequent causes, either predisponent, or exciting, of pericardial inflammation; and of the influence of these habits it is impossible to imagine a better instance than that of Mirabeau, who was destroyed by this disorder.

Next to the causes now mentioned, acute rheumatism, or the rheumatic diathesis, has been very often observed to be followed by acute pericardial inflammation, and thus to terminate fatally. The kind of rheumatism most productive of this metastatic inflammation is that which affects the fasciæ, the fibrous sheaths of the synovial capsules, and the synovial capsules themselves. Thus, after rheumatism of the wrists, ancles, or small joints generally, either with or without subsidence of the articular pains, the patient is suddenly attacked with

palpitation, pain in the region of the heart, irregular pulse, great pericardial anguish, panting and *orthopnoea*, followed by constant jactitation of the extremities, and death, when it is found that the pericardium is much injected, and lined with adherent coagulable lymph and purulent fluid.

TERMINATIONS.—*Pericarditis* may terminate, 1. in resolution; 2. in exudation of lymph, causing partial or general adhesion of the pericardium and heart (*sympphysis cardiaca*); 3. in effusion of sero-purulent or purulent fluid (*pyocardia*); 4. in sub-serous suppuration; 5. in serous infiltration within the pericardium (*hydro-pericardia*); the latter three generally fatal.

The treatment of pericardial inflammation must be conducted on the general principles of antiphlogistic management, the particular details of which have been already delivered under the head of *Pleurisy*.

§. IV. Inflammation of the *Peritoneum*. *Peritonitis*. *Peritonitis Conjunctiva*, Hull. *Peritonite*, Pinel, Broussais, &c.

J. G. Walter, de Morbis Peritonaei et Apoplexia. 4to. Berolini, 1785.—An Essay on Phlegmatia Dolens, including an account of the symptoms, causes, and cure of *Peritonitis Puerperalis* and *Conjunctiva*, &c. &c., by John Hull, M. D., Manchester, 1800. § vi. p. 287. *Peritonitis Conjunctiva*.—A Practical Treatise on various Diseases of the Abdominal Viscera, by Christopher Robert Pemberton, M. D. F. R. S., &c. &c. London, 1807. 2d edit. Chapter I. p. 1. The Peritoneum.—The Morbid Anatomy of some of the most important parts of the Human Body, by Matthew Baillie, M. D. &c. Lond. 1812. 4th edit. p. 126.—Histoire des Phlegmasies ou Inflammations Chroniques, fondée sur de nouvelles observations de Physique et d'Anatomie Pathologique, &c. &c., par F. F. V. Broussais, Sect. ii. Chap. iv. p. 397. Paris, 1808 and 1822.—Tracts on Delirium Tremens, on Peritonitis, and on some other internal inflammatory affections, &c., by Thomas Sutton, M. D., &c. London, 1813, p. 78.—The Morbid Anatomy of the Human Gullet, Stomach, and Intestines, by Alexander Monro Jun., M. D. F. R. S. E., &c. &c. Section xx., p. 248. Of the Inflammation of the Peritoneal Coat.—Clinical and Pathological Reports, by Samuel Black, M. D., &c. &c., Newry, 1819. *Peritonitis Chronica*, p. 155.—Memoire sur l'Anatomie Pathologique du Peritoine, par M. Scoutetten, D. M. P. Archives Gen. T. iii. 497. Paris, 1823; and iv. 386. 1824.—Cases and Observations illustrative of Diagnosis, when adhesions have taken place in the Peritoneum, with remarks upon some other morbid changes of that membrane, by Richard Bright, M. D., &c. Medico-Chirurgical Trans. Vol. xix. p. 176. London, 1835.

Inflammation of the peritoneum is attended with nearly the same pathological changes as those which occur during inflammation of the other serous or diaphanous membranes. Loss of transparency, injection with numerous minute vessels containing florid, sometimes purplish blood, pulpiness, and roughening

of the membrane, with discharge or effusion, as it is named, of coagulating lymph, and serous or purulent fluid, are the usual phenomena which, either as concomitant or consecutive circumstances, attend the process of its inflammation.

ANATOMICAL CHARACTERS AND PATHOLOGICAL EFFECTS.

—The train of anatomico-pathological changes has been well described by Hunter and Baillie in this country ; and by Bayle, Laennec, and Broussais in France. The observations of the first are so good, that, if collected from the various parts in which they are scattered, they may be studied with great advantage. I place them in the natural order of the morbid process.

“ The following I give as an example, which I have often observed in the peritoneum of those who have died in consequence of inflammation of this membrane. The intestines are more or less united to one another, and, according to the stage of inflammation, this union is stronger or weaker. In some it is so strong as to admit of some force to pull them asunder ; the smooth peritoneal coat is as it were lost, having become cellular like cellular membrane. When the vessels of this part are injected, we shall find that in those parts where a separation has been made by laceration previous to the injecting, the injection will appear on that surface like small spots or drops, which shows that the vessels had at least passed to the very surface of the intestines.”

In parts where union was preserved till after injection, Hunter observed the three following facts. 1st, On separation, the vessels in some places coming to the surface of the intestines, and terminating all at once. 2d, In other places the vessels passing from the intestine into the extravasated substance, and there ramifying, showing plainly that the vessel was continued from the old to the new,—from the original tissue to the morbid production. 3d, In a great number of instances numerous spots of red blood in the extravasated substance, and on the surface of separation between the old and the new substance, giving a mottled aspect not unlike petechial spots.

These may be regarded as the first or incipient effects of inflammation attacking the peritonæum. If after the effusion of lymph the morbid process subsides spontaneously, adhesions or false membranes are the only traces of the disease. But if the inflammation stop not here, another train of events suc-

ceeds, the subsequent course of which will depend on the destruction of tissue which takes place, and on the powers by which this may be modified or counteracted. The chief of these subsequent phenomena are the following. *1st*, Purulent or sero-purulent fluid may be secreted in one or more distinct sacs, formed by the union and accretion of effused lymph. *2d*, Purulent fluid may be secreted by the whole inflamed membrane. *3d*, Ulceration of one or more points of the membrane may take place, and destroy it over a great extent.

1st, Purulent fluid may be secreted with the lymph, and deposited in a distinct sac or cyst. "Inflammation," says Hunter, "attacks the external coat of an intestine; the first stage of this inflammation produces adhesions between it and the peritoneum lining the abdominal muscles. If the inflammation does not stop at this stage, an abscess is formed in the middle of these adhesions." This circumstance of the occurrence of purulent cysts in the peritoneal folds of the intestines was early noticed by Morgagni, (Epist. xxxiv. 22.) and his translator, Mr Cooke, remarking the insidious manner in which they take place, has reported an interesting example, in which an abscess, containing about five ounces of purulent fluid, had been formed by coagulable lymph, uniting several convolutions of the jejunum and ileum with the cæcum, in the right inguinal region. (P. 52.)

Dr Black of Newry had previously related a case, in which several sacs containing purulent fluid had been formed by effusion of lymph from the inflamed peritoneum; and three distinct purulent abscesses were found in the mesentery. (P. 173—174.)

2d, Purulent fluid may be secreted by the whole inflamed membrane, without breach of surface. I already, when treating of the serous inflammations generally, had occasion to announce this fact; but it may not be improper to state shortly the circumstances relating to its occurrence in the instance of the *peritoneum*. Hunter early remarked that the *peritoneum*, when inflamed, secretes purulent matter without breach of surface. "In some instances," says Baillie, "instead of serum, a large quantity of pus is found." Willan mentions a fatal case of peritoneal inflammation, in which a large quantity of pus was found effused into the abdominal cavity (Reports, p. 186, 1797). Dr Black, who records a case in which

“the abdomen contained more than two quarts of a thin purulent fluid, of a turbid appearance,” states, that he searched carefully, but unsuccessfully, for an abscess, and takes credit for “supposing that pus had been secreted from the inflamed surfaces.” Dr Black had forgotten, in the formality of this conclusion, the valuable remark of John Hunter, that “the cavity of the abdomen had here acquired all the properties of an abscess;” but the certainty with which he establishes the pathological fact is an ample compensation for this omission. In several cases of chronic *peritonitis*, that is, of peritonitis lasting for several weeks, which have come under my own observation, I have seen many folds of small intestine connected by lymph exudation, and a considerable quantity of genuine purulent fluid bathing the adhering masses, and filling the hollows of the lumbar and iliac regions. In many instances of the chronic disease, the fluid effused is milky, or like muddy whey. Thus Broussais, also, in his dissections, mentions milk-like serosity (xli. xlix.) in the *peritoneum*, milky serosity in the small pelvis (xliii.), abundance of a whitish fluid like turbid milk and water (xlv.) in the belly, a white, ropy, inodorous fluid with cheesy flakes (xlvii.), and a yellowish fluid with pulpy, yellowish, or whitish flakes (lii.) in the cavity of the abdomen.

It is very common to meet with this milky or sero-purulent fluid in the persons of women who are cut off by child-bed fever; and Hunter, who was aware of the fact, states it as an instance of the combination of the adhesive with the suppurative inflammation,—a circumstance to which he ascribes the unfavourable issue of such cases. “This mixing of the suppurative with the adhesive, or the hurrying on of the suppurative, I have frequently seen in the abdomen of women who have been attacked with the peritoneal inflammation after childbirth, and which, from these circumstances, became the cause of their death.” I am not aware that it can be accounted a cause of death in any other way than as it denotes a violent and unmanageable form of the disease.

In some instances the fluid is tinged with blood, (Broussais, case xlv.) constituting a sort of hemorrhagic *peritonitis*.

3d, At a further stage, ulceration may take place at one or more points of the membrane, and destroy a considerable space of it. We have already seen that inflammation which is not

stopped on the occurrence of lymph exudation and adhesion, proceeds to suppuration. I have now to notice that, in the language of Hunter, this matter acts as an extraneous body; the abscess increasing in size from the accumulation of matter, maintains a degree of mechanical pressure which irritates; and this irritation not destroying the disposition to form matter, suppuration is continued, and the ulcerative inflammation takes place. "If suppuration begin in more parts of the adhesions than one, they are commonly united into one abscess; absorption of the parts between the abscess and the skin, or mucous membrane, takes place, and the matter is led on to the external surface of the body, where it is at last discharged." (467).

This process of ulceration may take place either in the muscular or in the intestinal peritoneum. The first is the most common, and the process may be so extensive and complete as to destroy the whole membrane on the fore-part of the abdomen, and expose the transverse, (*transversi abdominis*,) and straight muscles (*recti*,) as distinctly as if they were cleanly dissected, and leave the tendons of the lateral muscles in rags, partly gone, partly in the form of sloughs. At the same time, the intestines are covered with a coat of lymph, which is believed by Hunter to prevent the matter from irritating and producing ulcerative inflammation of the bowels, and from diffusing itself all over the abdominal cavity. (Hunter, Part ii. Chap. vi. Section vi. p. 461, and Section ix. p. 467.)

It is matter of observation, that the inflammatory process arising in the peritoneum, and terminating in suppuration, betrays less tendency to pass inward towards the bowels, than outwards towards the skin; and that ulcerative destruction of the intestinal peritoneum is a much less frequent occurrence than that of its muscular portion. It was early remarked by Hunter, that if inflammation attacks the peritoneum covering an intestine, and if adhesions between it and the peritoneum lining the abdomen are a consequence, the inflammation passes immediately through the abdominal muscles towards the skin, while the proper coats of the intestine shall in most cases remain sound. (236) And afterwards, when speaking of the ulcerative inflammation, he states, "that if the disposition for ulceration was equal on every side of the abscess, it must open into the intestine, which is seldom the case, although it sometimes does." It is also the express testimony of Baillie, that

he "did not recollect to have seen one instance in which the ulcer had begun on the outer or peritoneal surface of the intestines, and had spread inwards." (160). To show that this termination, though very uncommon, is neither impossible nor unknown, I may mention, that, of sixteen cases of chronic peritoneal inflammation reported by Broussais, there is only one in which perforation of the intestines had taken place; and this he admits is the only instance in which he observed this termination. (Observation lv. p. 480, Section ii. Chapter iv.) In Willan's case above alluded to, the colon was superficially ulcerated in several places.

In some cases of chronic inflammation, another effect, noticed both by Pemberton and Broussais, is enlargement of the mesenteric glands. It is not uniform, but found in certain cases only; and I believe it is most usual in that class of cases in which peritoneal inflammation has succeeded to inflammation or ulceration of the mucous membrane or its follicles.

The changes and morbid products now enumerated may take place, either within a short space of time, that is to say, five, six, or eight days, and with symptoms and symptomatic fever more or less violent, or within a much longer space of time, and with very trifling and obscure symptoms of general disorder or local uneasiness. In the first case, the disorder is regarded as acute; in the second case, it is considered chronic; and there is an intermediate form, in which the changes take perhaps some longer time than the most acute, and some shorter space than the most chronic, with corresponding modification in the nature of the general and local symptoms, and to this variety the name of sub-acute peritoneal inflammation has been applied.

In each and all of these various degrees of the disorder, the pathologist remarks certain peculiarities which deserve to be studied.

1. When inflammation takes place in the peritoneum, it may, under the use of energetic measures promptly employed, terminate, there is reason to believe, without giving rise to the effusion of albuminous exudation. As there is no effusion of lymph, no adhesion takes place between the corresponding and applied parts of the peritoneum; the overloaded vessels gradually return to their usual capacity; the natural circulation

and secretions are re-established ; and the mutual movements of the intestinal cylinder proceed as formerly. This is the only termination by resolution.

2. In a large proportion of cases, whether from the patients neglecting to apply sufficiently early for advice, or from the original intensity of the disorder, or from the antiphlogistic measures not being adopted with sufficient promptitude, and carried to the proper extent, secretion of albuminous fluid takes place in more or less abundance. This, though secreted at first, fluid, speedily undergoes spontaneous coagulation. The coagulated part adheres to the inflamed surface or surfaces of the membrane, while the serous fluid portion trickles away gradually, and drops down into the most dependent portions of the peritoneal cavity. The former is penetrated with numerous minute vessels conveying red blood, and constitutes the medium of union between the two inflamed or raw and vascular surfaces. At this stage of the process, either under the influence of remedies, or spontaneously, the inflammatory process may stop, and gradually subside ; for it is to be remarked that the effusion of lymph is, as it were, the natural cure or course of the inflammation, when it has not been checked in the stage of injection. The effusion of lymph over the inflamed surface acts as a protecting covering to it while in the inflamed condition, and prevents the inflammatory process from causing other or ulterior pernicious effects in the membrane or the connected tissues. When the inflammatory process ends in this effusion, the coagulated part of the lymph, after becoming penetrated with vessels, gradually shrinks in size, and becomes more firm, while the vessels cease to convey red blood. As this process advances, while the inflammatory injection subsides, and the circulation resumes its wonted channels, the lymph thus organized is at length converted into false membrane, more or less firm, connecting the applied surfaces of intestine to each other, or to other parts of the abdominal cavity. The serous part in the meantime not being augmented by new additions, gradually diminishes in quantity, and at length disappears. It is then said to be absorbed.

The adhesions caused by the false membranes thus formed are not unfrequently in their turn the cause of disease. In the natural state, it is certain that the folds of intestine move during the peristaltic motion, freely, and without let or hin-

derance on each other. One of the first effects of peritoneal inflammation is to render this process of mutual motion painful and difficult, and sometimes to impede it more or less completely; and hence, after inflammation has subsisted for a day or two, not only are the bowels obstinately bound, but, as the contents are not propelled downwards, the intestinal tube becomes distended with air, and the abdomen is distended with swelling, which emits on percussion an unusually clear sound, and is said to be tympanitic. This is confined to the early stage of the process where adhesions do not yet exist, or at least not to any great extent, and when the membrane is only roughened; and the proof of this is found in the fact, that, as the inflammatory symptoms disappear, so also the tympanitic swelling disappears, with evacuation of the contents of the tube, and more or less escape of air.

When adhesions are formed, they may either connect two or more intestinal folds together, or they may connect these folds to the muscular peritoneum. In either case, more or less impediment to the free motion of the different portions of the intestinal canal is caused; and hence, in individuals who have undergone one or more attacks of peritoneal inflammation, symptoms of intestinal obstruction, often amounting to *ileus*, are occasionally seen.

Of this form of impediment, several varieties are observed.

a. A number of intestinal convolutions may be matted so firmly together, that not only are they prevented from moving upon each other, and the contents thereby prevented from being urged from the gastric to the anal end of the intestinal canal, but they are so tight, that the portions adhering cannot be distended to their usual size, and never beyond it, and the result is a constant impediment to the process of peristaltic motion and intestinal digestion.

This state of intestine I found in the body of a child of eighteen months, which was inspected on the 28th December 1835, by Mr Watson and myself, and in which the adhesions had given rise to *marasmus*, with extreme emaciation, terminating fatally.

b. Two or more folds of intestine may be united by means of firm slips or bridles of membrane, not round the whole circumference, but at the antimesenteric point of the bowel, in such a manner as to allow the bowels to move on each other with tolerable freedom, and even to admit of slight separation

at the mesenteric side of the intestine. In consequence of this position of two portions of bowel, united, however, by false membrane at the antimesenteric part, a portion of intestine may, in the course of the peristaltic motions, be thrust into the space between the two adhering portions of bowel, and thus first impeded in its motions, and then completely obstructed and strangulated. Of this I have seen several good instances. The upper part of the bowels becomes much distended, causing tympanitic distension of the abdomen, while the lower is proportionally contracted. I have seen the ileum in cases of this kind enlarged to five or six times the usual size, and presenting at first sight an appearance like the colon, while, upon examination, the latter bowel was found shrunk to the size of a tube, collapsed, and not more than one inch in diameter.

The appearances now described belong to the acute form of the disease when it has not proved fatal, and when it has stopped, after moderate effusion of coagulable lymph.

When the morbid action is not thus suspended, but continues, both lymph and serous or sero-purulent fluid continue to be effused by the membrane. But as the latter is most abundant, especially when the inflammation continues any time, its quantity produces most pernicious effects. It at once forcibly separates parts recently united by means of soft lymph, and it prevents other parts from being united by the same means, so that whatever quantity of fluid lymph is secreted, its coagulation is of no avail in counteracting the progress of the inflammatory action. In the course of this forcible separation, if the lymph have been penetrated by blood-vessels, which is very generally the case, these are torn open, and the red blood thus effused tinges the yellow, serous, or sero-purulent fluid of a bloody colour, according to the number of the vessels rent asunder. As the action continues, the quantity of fluid secreted also continues; but as there is no apposition of the inflamed membrane, there is no adhesion or agglutination. The process, in short, is now disjunctive or disuniting.

In this mode, which is one of the chronic form, it may either prove fatal by the severity of the symptomatic disorder which it produces, or it may proceed sometime longer, giving rise to purulent or sero-purulent *ascites*. That this is the mode in which many cases of *ascites* take place, is abundantly proved by the appearances found in the cases recorded by Dr Cramp-

ton, in the second volume of the Transactions of the Dublin Association, and by the appearances found in such cases as that of Sir James Craig, recorded by Dr Somerville.—(Medico-Chirurg. Tr. v. 340.)

In such instances there is strong reason to believe, from our subsequent experience, that the cortical or proper granular matter of the kidneys was considerably diseased.

In some forms of peritoneal inflammation the different *omenta* become very much diseased. Either the large *omentum* may be attached at one edge or corner to a portion of intestine, by means of coagulable lymph, which finally becomes organized, or it may be attached to a part of the muscular peritoneum. One of the most common changes in the chronic form of the disease is for this membrane to become drawn up to its gastro-colic attachment, and greatly shrivelled, yet thickened and heavy, so that instead of its original appearance of an expanded membranous web, it is coiled up like a thick cylinder along the large arch of the stomach and the transverse arch of the colon. In some instances, even it is small in size when shrunk up in this manner, and the change is liable to give the observer reason to think that it is altogether destroyed or wanting.

In other cases, especially of the subacute form of the disorder, the *omentum* presents on its surface or within its folds, masses of puriform lymph or patches of purulent matter.

Besides the forms now mentioned, which may be regarded as the most frequent of *peritonitis*, occurring as a general inflammatory lesion, others still deserve some attention.

When inflammation attacks the mucous membrane of the intestinal tube, and proceeds to the subjacent filamentous and muscular tissues, it also causes peritoneal inflammation, though in a circumscribed form. Thus when ulceration, after affecting the follicles and glands of Peyer, or the villous membrane of the colon, attacks the muscular coat, it at the same time produces inflammation first in the attached, and then on the free surface of the peritoneal tunic; and while it renders the latter membrane extremely brittle and lacerable, it first roughens the free surface, and then causes a deposition of lymph in small circumscribed masses. These are sometimes called, very erroneously, in my opinion, tubercles. They are simply masses of lymph, originally effused soft and semifluid, and eventually becoming solid, and occasionally forming mutual adhesion with the contiguous fold of intestine. It is the peculiar character

of these bodies, that they are arranged in the elliptical or circular disposition.

It is interesting to remark the final cause of this action. It has the effect of preventing or, at least, retarding perforation of the intestine, and consequently a fatal attack of general *peritonitis*; and I have seen several instances, both of ulcers of the villous membrane of the stomach, and also of the intestinal canal, in which this provision, by means of adhesive inflammation of the peritoneum, had been the means of retarding the fatal event, and prolonging life for weeks or months.

In some instances, even this system of adhesion with perforation does take place; but the firm union with the contiguous bowel prevents the issue of intestinal contents. It has been even observed to take place over a great number of folds, all of which then appear like short cylinders of bowels communicating with each other, but not with the general cavity of the *peritoneum*. A good case of this kind is given by Mr Howship, (p. 264,) and one is recorded by Dr George Gregory, who, however, has mistaken the manner in which the disease is produced, (*Medico-Chir. Trans.* xi. 258.) The explanation now given of the mode in which these communicating intestinal cylinders are made to open into each other, is the correct one.

In some instances these perforations of the intestine are prevented from making their way into the general peritoneal cavity, by forming union with the large omentum, and even with the muscular peritoneum. In one instance of the latter description, in which the lower part of the *ileum* and the *caput cæcum* had been penetrated by ulceration of their villous membrane, and which had at length proceeded to affect the peritoneal tunic, the latter had formed firm adhesions, first with the muscular peritoneum of the right iliac region, and after this had been sufficiently general and firm to prevent the escape of the intestinal contents, the suppurative process had attacked the abdominal muscles, and formed among them a sinuous abscess, communicating with the cavity of the intestine; and, had not death taken place at this time, the abscess must have burst externally, and formed an artificial anus or fecal *fistula* in the right iliac region. Cases of a similar nature are recorded by Dr John Burne in the 20th volume of the *Medico-Chirurgical Transactions*.

Another circumstance in the pathological history of this

disease is the formation of tubercles in the peritoneum. Valsalva and Morgagni observed in their dissections instances of these bodies, various in shape, size, and contents, growing from different parts of the peritoneum, (Epist. xxii. 18, 19. xvi. 30. xlv. 8,) or of its productions. Broussais remarked them in his 45th, 47th, 48th, 51st, and 54th cases. And Dr Baron published in 1819 an interesting account of the progressive changes of this disease.*

Of tubercles, two forms, which are attended with inflammatory characters, may be distinguished. The first is a species of tubercular or rather tyromatous deposition taking place in the *peritoneum*. A number of rounded bodies, varying in size from a pin head to a pea or more, appear at the free surface of the membrane, and, as they increase in size, form union with the corresponding peritoneal surface of the adjoining bowel, or of the *omentum*, or of the muscular peritoneum. This union is accompanied with additional exudation of lymph and sometimes of purulent matter. This is what is generally found on opening the dead body. Dr Baron finds further, that, at an early stage of the growth of these bodies, they appear in the shape of small spherical or spheroidal cysts containing fluid almost pellucid, and he consequently infers that they are hydatids in original formation. Upon this point I do not feel competent to give a decided opinion, not having met with instances of tyromatous or tubercular growths which I could trace to the previous state of hydatids. I describe these bodies, therefore, as I have seen them, and must call them tyromatous bodies of the peritoneum, because they consist chiefly of that form of coagulated albumen to which I have elsewhere applied the name of tyromatous matter, (*Τυροσ, Caseus*).

These tyromatous bodies must not be confounded with encephaloid tumours of the peritoneum, to which they certainly bear some external and even internal resemblance.

The second form of tubercles taking place in the peritoneum is the small hard chondroid or gristle-like tubercle, appearing in the form of numerous bodies disseminated over the great part or the whole of the membrane. These are always small and

* An Inquiry illustrating the Nature of Tuberculated Accretions of Serous Membranes; and the origin of Tubercles and Tumours in different Textures of the body, with Engravings, by John Baron, M. D. London, 1819, 8vo.

Illustrations of the Inquiry respecting Tuberculous Diseases, by John Baron, M. D. London, 1822, 8vo.

extremely firm,—sometimes not larger than a millet seed or a small pin-head. Their colour is generally a shade of black, and commonly they are slightly translucent. These are disseminated at irregular distances, but are always isolated and detached, never congregated together. They cannot be said to appear at the surface of the peritoneum only, for very often they penetrate to some depth in its substance.

These tubercles, or miliary tubercles, as they are usually named, of the *peritoneum*, appear always first in the intestinal peritoneum, and very often are solely confined to this portion of the membrane. They then affect the different *omenta*, and may at length extend to the muscular peritoneum. This, however, is comparatively rare, whether it be that the disease proves fatal before this, or that it has less tendency to attack this than the intestinal division of the membrane. In this as in the other forms, the large omentum is drawn up towards its gastro-colic attachment, and shrivelled into a solid cylindrical mass.

The presence of these bodies in the *peritoneum* deranges much the circulation and secretion of the membrane. They are partly an effect of chronic inflammation; but they also cause that process, and give rise to serous or sero-sanguine effusion within the cavity. In general, their presence is attended with pain of the belly, and a sense of uneasy weight; and when they have continued some time, they give rise to symptoms of abdominal dropsy, and frequent vomiting and obstinate constipation.

Scoutetten yet mentions, as found in the peritoneum of persons cut off by old inflammation of some organ of the chest or belly, small grayish specks, disseminated in greater or less number over the mesentery and large *omentum*, and almost always over the small intestines themselves. From the rest of the description of this author, it appears to me that these are merely the miliary tubercles of the peritoneum. (*Archives Generales*, Tome iv. 1824. p. 398.)

Lastly, the peritoneum is liable, after chronic inflammation, to be transformed into cartilage, bone, or hard matter, called generally *scirrhus*. The transformation into cartilage seems rather to be the occasional conversion of the albuminous deposit into that substance, than the degeneration of the membrane itself. At least, the cartilaginous patches are evidently raised above the level of the membrane, and seem to be pro-

duced very much as cartilaginous patches in the *pleura*, and other serous membranes.

The last effect of inflammation in the *peritoneum* is gangrene, which takes place in the form of small portions varying in size, of a grayish, or slaty, or black colour, and emitting rather a fetid heavy odour. It is rare for a large portion of the peritoneum to become gangrenous; and more frequently this takes place in the form of limited sloughs.

Several of the changes now specified are seen to greater advantage in cases of strangulated hernia than in any other disorder, since in these cases not only are the whole intestinal tissues inflamed, but the inflamed state of the peritoneum may be observed in comparison and contrast with that of the other tissues. In the early stage of this lesion it is chiefly obstructed circulation and greater vascular congestion, causing serous and sero-sanguine effusion from the peritoneal surface. Afterwards it is inflammation, in consequence of intense reaction from the mechanical injury; and this very often terminates at once in effusion of lymph, and gangrene of the peritoneum.

The inflammation may be slight or severe, partial or generally diffused, and acute or chronic. When it is slight, it is generally confined to the membrane itself, and spreads over its surface, but without passing to the subjacent tissues. The tissue to which it most usually passes is the cellular and muscular, sometimes the mucous tunic of the intestines; for it does not very often pass to the muscular tissue of the abdominal *parietes*. In this case, the intestines become thicker and more massy than usual, in consequence of the greater accumulation of blood in the small vessels, and extravasation of fluids into the intestinal cellular tissue. In some instances they are enormously distended with air. If the inflammation affect particularly the mesentery, mesocolon, or omentum, each of them becomes much thicker and more bulky than natural, and the last may be as thick as the fist, and lie like a circumscribed mass along the great arch of the stomach. This change is occasioned by effusion of coagulating lymph into the cellular tissue between the peritoneal plates. The parts thus changed may be greenish, bluish, or dark-red, in consequence of stagnation of blood in the vessels.

By partial inflammation is meant that which is confined to a certain spot or region more or less strictly defined. The peri-

toneum is the most extensive serous membrane of the human body; for it not only lines the inner surface of the abdominal muscles, the lower surface of the diaphragm, the inner surface of the internal iliac muscle (*iliacus internus*,) and the anterior surface of the great lumbar muscle (*psoas magnus*,) and the square muscle (*quadratus lumborum*); but it is reflected, as it is said, from the spine to form the outer coat of the stomach, intestines, *duodenum*, &c. and covers the liver, spleen, and upper part of the urinary bladder in both sexes, and the greater part of the womb in the female. When this membrane, therefore, is generally inflamed, a most extensive disease must take place; and though this is neither impossible nor unknown, it is more frequent to find the membrane inflamed over a certain space only.

This inflammation may be confined to the gastric or to the enteric portion of the *peritoneum*, with more or less accuracy. In some instances it has been known to affect a portion only of the enteric peritoneum; and in the disease, to which puerperal women are subject, it is chiefly the uterine division of the membrane, and that which covers the ovaries and Fallopian tubes, that is inflamed. It is undoubtedly on these views that nosological writers have made separate diseases of *gastritis*, *enteritis*, *hysteritis*, *mesenteritis*, *epiploitis*, &c.; for it cannot be denied that every case of *enteritis* or intestinal inflammation presents on inspection the traces chiefly of peritoneal inflammation. Of this the lymph gluing the folds of intestine together, and these again to the muscular peritoneum, and the fluid serous, sero-purulent, or purulent in the iliac and lumbar *fossæ*, and between the intestines, as well as the vomiting, abdominal pain, and obstinate constipation during life, are sufficient proofs.

SEMIOGRAPHY OF THE DIFFERENT FORMS OF PERITONITIS.
—Cullen regarded phlegmonoid *gastritis* and *enteritis* as inflammation of the gastric and enteric peritoneum respectively, (385, 404); and unquestionably the assemblage of symptoms, to which these names have been given, are in most cases found to depend on inflammation, more or less considerable, of these parts of the abdominal membrane. But although he assigned a nosological place to peritoneal inflammation, he does not appear to have applied to it those extensive views, which observation and morbid anatomy have opened to recent pathologists. It is singular that a pathologist, in other respects so rational, should have limited the term *peritonitis* to inflammation of the

muscular *peritoneum*, and of the mesentery and *omentum* only. It is now well ascertained that we ought to include under this term inflammation not of these parts only, but of the *peritoneum* covering the stomach, *ileum*, colon, and even of the liver and spleen and womb.

For these reasons I shall divide the history of *peritonitis* into that of *a. peritonitis* in general; *b.* of gastric *peritonitis*, or the *gastritis* of nosologists; *c.* of enteric *peritonitis*, the *enteritis* of nosologists; and *d.* uterine *peritonitis*, or that in which the uterine *peritoneum* is the chief seat of the disease.

Peritonitis may be acute or chronic. The distinctions founded on the duration of diseases are generally vague and indefinite; but in the present case the difference of duration is attended with some difference, often considerable, in the severity and distinctness of the symptoms. In general that may be said to be an example of acute inflammation of the peritoneum, in which the symptoms are sudden in invasion, intense, well-marked, and speedily tending to termination, either by resolution, effusion, adhesion, or suppuration. That, on the contrary, may be said to be an instance of chronic peritoneal inflammation in which the symptoms come on slowly and gradually, sometimes insensibly, continue indistinct or obscure, and retain for a considerable time the same character or tenor without manifesting any tendency to terminate, unless in the slow and gradual effusion of serous, sero-purulent, or purulent fluid, with flakes of lymph and partial adhesions.

A. a. Acute peritonitis, though it may take place without shivering, generally commences with this symptom, thirst, general heat and quick pulse, and is attended from the first with a sense of heat and pain in the belly, at first confined to one part, sometimes diffused over the whole surface. The pain is much increased by pressure or coughing; but produces no inclination to go to stool; the pulse is at least 100 in a minute, sharp, and sometimes full or tense; and the tongue, though it may have a natural appearance, is sometimes clammy and dry.

In the course of about twenty-four hours, the pain becomes more acute, and pressure of the belly can scarcely be borne; considerable swelling and tension take place over the whole belly; and the patient finds most relief from pain, by remaining motionless on the back, with the knees slightly raised, and avoids coughing or strong motion of the abdominal muscles most anxiously; and hence the respiration, though frequent, is

mostly, sometimes entirely, thoracic. At the same time the pulse rises to 120 or 130 in the minute, and the tongue begins to be covered with a cream-coloured mucus, and though it is moist, there is great thirst. The tension of the belly continues to increase to the sixth, seventh, or eighth day, on one of which the disease, unless opposed by suitable remedies, generally proves fatal. In most instances, more or less sickness is felt, vomiting takes place occasionally, and the bowels are obstinately bound throughout the whole course of the disease.

This malady, which Pemberton regards as the *peritonitis* of Cullen, may be distinguished, according to him, from every other disease of the belly, by the pulse being above 100 in a minute, by the pain being permanent and increased by pressure before tension takes place, by its producing no inclination to go to stool, and by its not being alleviated if this evacuation takes place either spontaneously or artificially. It may be considered as the acute diffuse or spreading inflammation of the peritoneum.

b. When the peritoneum covering the stomach is inflamed, it constitutes the phlegmonic inflammation of that organ mentioned by Cullen, (*Gastritis phlegmonoidea*, *Gastritis*); and is attended with peculiar symptoms. The patient complains of acute pain in the region of the stomach, augmented by pressure, or articles of food taken into it; is very sick, vomits almost every thing swallowed, and is distressed with frequent painful hiccup. The skin is hot, the tongue dry, the thirst considerable; the pulse is quick, small, and hard; and there is a greater loss of strength in all the functions of the body, than in the case of almost any other inflammation. "If the stomach is inflamed," says Hunter, "the patient feels an oppression and dejection through all the stages of the inflammation; simple animal life seems to be hurt and lessened, just as sensation is lessened when the brain is injured; the pulse is generally low and quick, the pain is obtuse, strong and oppressing, such as a patient can hardly bear."—(P. 324, 4to, edit.) "There is now and then," says Pemberton, "at the very first attack, so great a degree of prostration of strength, accompanied likewise by a pulse scarcely perceptible at the wrist, as might induce us to consider the patient at the point of death, and unequal to undergo the process above described. These appearances, however, arise wholly from the inflammation extending to the peritoneal coat of the stomach and intestines."—(P. 9.) The truth is, that

the extreme and mortal sickness prevents the action of the heart, which would otherwise be violent, from being so strong as it is in inflammations attended with no sickness; while the anxiety arising from the pressure of the diaphragm and abdominal muscles on the peritoneal coat of the inflamed organ gives the disease a character which easily announces its presence.

c. When the *peritoneum* of the intestinal canal, especially of the *ileum*, is inflamed, it constitutes the ordinary intestinal inflammation of authors, *Enteritis phlegmonoidea* of Cullen and others, and is attended with a train of symptoms which have been enumerated by authors in treating of this disease. The clearest account is given by Pemberton, according to whom it may commence in two modes, either suddenly and violently, with distinct symptoms, or more slowly and insidiously, without much uneasiness for one or two days.

In the former case, which is most common, the pain of the belly is extremely acute and continued, and much increased by pressure. The pulse is generally quick, sometimes not above 90 for the first two days, when it is soft and full, but often 120 or 130 in a minute, small and hard; the respiration is quickened and thoracic, while the abdominal muscles are generally unmoved; the countenance is anxious; and there is continual tossing of the arms, while the patient endeavours to keep the trunk of the body at rest. There is also considerable thirst, the tongue is dry and white, sickness and vomiting take place, especially when the small intestine is inflamed, and the bowels are constipated. The inflammation may extend to the muscular coat, or at least rouse it to inordinate action, causing occasional paroxysms of violent pain, which must not be confounded with colic. The permanence of the intestinal pain during the intervals of these paroxysms will serve, with the other symptoms, to distinguish the nature of the disease.

The approach of *enteritis* may be more gradual, and its progress more insidious, or at least with symptoms which disguise its proper characters. It may proceed for one or even two days, without exciting uneasiness sufficient to alarm the patient, who ascribes his disorder to the effects of mere costiveness. In other cases, considerable fever may appear shortly after the first painful sensations within the belly. Again, it may assume the appearance of a severe kidney affection, and pain across the loins will be the prominent complaint, and divert the attention, both of patient and practitioner, from the bowels. But

this is soon succeeded by pain across the belly, most severe about the site of the cæcum, shooting thence towards the pubes, and occupying a considerable portion of the right flank. In other instances, the pain is confined with considerable accuracy to the navel, and the space between it and the pit of the stomach, or twists round the navel with excruciating torment.

After these symptoms have continued a few hours, sickness comes on, and, relieving only for a moment, is then followed by distressing squeamishness; the bowels are obstinately bound; what is injected is returned unaltered, and what passes from the rectum unsolicited is void of the ordinary smell and colour of feces. At the same time the patient complains of successive chills; but there is rarely any distinct fit of shivering. The pulse in some rare instances, soft and full, under 100, is generally quick and hard, sometimes small and wiry; the tongue is dry and white, with a streak of brown fur down its middle; and the thirst is excessive. The belly becomes enlarged and tense, and the slightest pressure aggravates the pain. The slumbers are short, and interrupted by continual startings.

This is the state and progress of the symptoms during the first, second, and third days. About the fourth, the means employed are generally followed by a liquid stool more natural in smell and colour, and promising, by the continuance of purgatives, a continuance of such discharges. This expectation is seldom realized; for on the fifth day signs of fresh obstruction return. If any stools pass, they are green and watery; and the patient relapses into the general uneasiness and local suffering of the third day.

In this manner the disease proceeds to the eighth or ninth day; the swelling of the belly increases; the sickness is almost constant; and though the patient is incessantly urged to stool, a mere watery fluid is discharged. His pulse becomes more frequent and smaller, the fur of the tongue becomes browner and drier, and when left to himself, he mutters deliriously. As these symptoms proceed, the pulse becomes weaker and intermitting, the extremities become cold, while the forehead is bathed in a chill sweat; and about twenty-four hours after the commencement of the delirium in general, extreme restlessness and anxiety are followed by convulsive twitchings, laborious breathing, and death.

In cases of more fortunate issue, about the sixth or seventh

day, the stools pass off natural in colour and smell. The countenance of the patient becomes more cheerful, he is less restless, and, enjoying intervals of ease, he complains more of real griping than of his former fixed pain; and the right flank and lower part of the belly may be pressed without much uneasiness. Refreshing sleep follows, and complete recovery may be expected by persevering in the usual means of keeping the bowels in action.

The duration of this disease varies according to the mode in which it commences, and the severity of the symptoms. In the most rapid cases it may terminate fatally in three or four days; in the more protracted it may be prolonged to the eighth or ninth, after which it either may undergo resolution, or may cause death, or may become chronic.

Male and female are equally subject to *enteritis* from early age to about fifty. It is met with at all seasons of the year, but, like other intestinal diseases, is more common in the autumnal part of summer. Cold and moisture, especially applied to the feet, are its most ordinary exciting causes.

A peculiar cause of acute *peritonitis* is ulceration of the gastric or intestinal mucous membrane proceeding to perforation of the *peritoneum*. This may take place either in the stomach or the intestinal canal. But the most usual part is the lower end of the *ileum*, or the *cæcum*. The peritoneal inflammation thus induced is peculiar in being sudden in its approach, violent and well-marked in its symptoms, and rapid in its progress to the fatal termination. The pain is almost invariably exceedingly violent, the pulse is extremely quick and small, the features become suddenly small and contracted, with paleness of the complexion, and the patient presents a sort of mortal agony and sinking, which can be by no remedies averted. It is often possible to recognize a greater degree of tympanitic distension and clearness on percussion, and more complete thoracic respiration, than in ordinary acute *peritonitis*.

B. Chronic inflammation of the peritoneum differs from the acute, not only in the mode of attack, but in its subsequent course. It advances by degrees, causing only occasional superficial pricking pains over the belly, without inclination to go to stool. The tongue, especially in the morning, is slightly covered with a white fur, the thirst is considerable, and the pulse is somewhat quickened; yet it is rare to remark any ex-

acerbation in the evening, or hectic flushes on the cheeks; the countenance, on the contrary, is languid, and the face is pale and doughy.

In the early stages of the disease, the patient is capable of performing his ordinary duties, and only complains after fatigue, of some tightness and pricking soreness over the belly between the flanks or haunches. This state may continue with little variation for many weeks or even months, during which time the operation of the bowels may proceed naturally, though more frequently the patient is costive. There is no tension of the belly, as in the acute form; but the skin and abdominal muscles are, in some instances, so loose on the peritoneum as to give a sensation of their playing freely over a tight bandage below. The patient complains less of pain than of tightness, which is much increased by congestion of the intestines, and relieved on their evacuation.

In the meantime the disease proceeds till it assume, from some accidental circumstance, the acute form, or the process of chronic inflammation become thoroughly established. In the latter case, as Pemberton observes, lymph is effused, which glues the intestinal folds together, and may absolutely interrupt the peristaltic motion. In the chronic disease, lymph is undoubtedly deposited between contiguous folds of intestine, and in many instances, the whole bowels are matted together into an agglutinated mass. This, however, is not the only effect of the process of chronic inflammation. As the disease advances, fluid of various consistence, serous, milky, sero-purulent, or purulent, is secreted, and trickles down into the lumbar hollows and between the intestinal convolutions. As this increases, the belly swells and is distended, and in many instances distinct fluctuation may be perceived. The contained fluid is generally mixed with flakes of lymph. Pemberton remarked the tendency of chronic *peritonitis* to be resolved, by effusing fluid and producing ascites. The truth is, that this inflammation has a natural tendency to serous or sero-purulent effusion, and it is one of the most ordinary causes of the disease named dropsy of the belly (*ascites*.)

While this process is going on within the abdominal serous membrane, it occasions manifest effects on the system and general functions. The skin is constantly hot and dry, or moistened periodically with a scanty, burning, and uncritical sweat;

the tongue is dry, and whitish, in some instances red and parched, and there is much thirst and heat of mouth; the pulse is quick, generally from 90 to 100, small, sharp, and hard; the bowels are irregular, sometimes open, generally much bound; and the urine is scanty, and deposits on cooling a brick-dust sediment. The sleep is disturbed and imperfect, and in general, considerable increase of heat and other febrile symptoms takes place, terminating in sweating towards morning. At the same time, while the belly is increasing in size, the extremities waste, the features shrink, the face becomes pale, and the general strength is greatly diminished.

Some time after albuminous exudation has taken place, and united the free surfaces of the intestinal and abdominal peritoneum, when the morbid action has not been so violent as to extinguish life, and when the exudation has become organized, shrunk and formed false membrane, it is often possible to recognize a new order of symptoms.

Of these the most prominent are the following. The dullness, which is the immediate result of the morbid effusion, does not disappear, but may either be slightly diminished, or remain stationary, or be increased, so that percussion elicits a sound perceptibly more dull than that emitted by the belly in the state of health. The abdominal swelling is not general, but is greater at some parts than at others. But the most important circumstance Dr Bright has shown to be, that when the abdomen is touched, or gently pressed, there is communicated to the finger a peculiar sensation, varying between the crepitating motion produced by emphysema, and that derived from bending new or stiff leather in the hand.

The same sensations are produced by palpation, whether the peritoneal folds be connected by adhesion, the result of common inflammation, or by that produced by the presence of miliary tubercles, or by any other similar growth. (*Medico-Chirurg. Transact.* Vol. xix. p. 177. Lond. 1835.)

The duration of this disease varies according to many circumstances, especially to its tendency of termination. It may terminate, 1st, in acute peritoneal inflammation; 2d, in ulceration of the intestinal or muscular peritoneum; 3d, in iliac passion, or insurmountable obstruction of the peristaltic motion; and, 4th, in wasting, (*marasmus*,) with gradual exhaustion. In either case it is fatal; and indeed Broussais confesses that

he knows of no other termination but death, which is generally sudden, and without rattle or agony. Mr John Burns, however, describes a case in which purulent ascites took place, and the matter was discharged by the navel, with restoration to health. *

ETIOLOGY.—The causes of chronic peritonitis are the same as those of the acute disease. It may occur at any age; but women, according to Pemberton, are more liable to it than men. Exposure to cold and moisture, especially cold chilling winds, is a fertile cause. Broussais saw it repeatedly succeed ague in Holland, and there is little doubt that the physical causes of ague are sufficient to induce inflammation of this membrane,—and especially of a chronic character. He also remarks that it is often the result of contusions of the belly, whether the violence alters the structure of the spleen, or merely dashes the folds of the membrane forcibly against each other. His attention was first directed to this circumstance by observing that several soldiers caught chronic pains of the belly, while working at the erection of the pyramid of Zeist; and he afterwards confirmed it in many patients, sent from the fortifications of Palma-Nuova.

TREATMENT.—The treatment of peritoneal inflammation is to be conducted on the general principles of controlling inflammatory action, and is to be varied only as the disease is acute or chronic.

The practical measures requisite in the acute form may be referred to, *1st*, those which counteract the local inflammation; *2d*, those which restore the healthy state of the intestinal canal; and *3d*, those which restore the healthy state of the skin and its secretion.

1. Of the first class are blood-letting, general and topical, revellent or counter-irritating remedies, &c.

In the first place, it is necessary to bleed largely from the system. According to Pemberton, sixteen ounces should be taken from adults, and proportionably less from a patient under that period. In most instances, I have found it requisite to take not less than twenty or twenty-five ounces from adults, and in some instances, thirty ounces will be taken before the most trivial impression be made on the disease. In every case, the practitioner must be guided by the circumstances of

* Transactions of the Medical Society of London, Vol. i. Art. vii. p. 155.

the patient, and the effects which blood-letting produces, both on his constitution, and on the symptoms of his disease. Perhaps fifteen ounces may be fixed for the minimum from an adult, and twenty-five or thirty for the maximum; for it is better to see the effect of the first, and afterwards attempt a second, or even a third blood-letting, than over-bleed the patient at the first. If the pain be not alleviated, and if the belly be still tender at eight hours after the first discharge, a second must be attempted to the amount of twelve, sixteen, or twenty ounces, according to circumstances. It generally happens, that after this second blood-letting, the pain in six or eight hours is less acute, and the pulse becomes less frequent, or at least softer and fuller. If the pain be less, though not entirely gone, twelve, eighteen, or twenty leeches may be applied to the belly, and after their bleeding, promoted by warm fomentations, has ceased, counter-irritating remedies, as blisters, &c. should be adopted. If the pain be not diminished, a third, fourth, or even a fifth bleeding from the arm should be taken; or if the strength of the patient be inadequate to these copious and repeated evacuations, if the pain continues while the pulse has become less frequent, leeches to the number of twelve or fifteen should be applied to the belly after the third or fourth general bleeding.

The common blistering plaster is a very convenient irritant. Some use the nitric acid, and some the emetic tartar ointment; but their use is attended with difficulties which are not met with in employing the common blister. It is to be used only after the pain is decidedly lessened, and the pulse begins to be slower and softer;—in short, when the disease begins to assume a topical character only. By observing this rule, these local applications are rendered most effectual, and the practitioner is not deprived of the means of ascertaining the variations of the disorder,—by pressure of the belly.

When the inflammation is believed to be confined to the enteric peritoneum, the blood may be taken from the belly by cupping-glasses, and they are supposed to have most effect when placed opposite the cœcum in the right flank. In every other respect, there is the same urgency for copious blood-letting, so as to exert a powerful impression on the arterial system, and on the disease.

2. Costiveness may be said to be at once an effect, and an aggravating circumstance of peritoneal inflammation, and, next to

the agents which act on the sanguiferous system, the physician looks for benefit from those which open the bowels, and determine towards the mucous surface of the intestinal canal. The choice among purgatives should be to those which operate rather with effect and certainty, than with rapidity and violence; those which rouse the bowels to expel excrements and morbid secretions, than those which merely discharge great quantities of fluid. For this purpose, castor-oil to the extent of six drachms or an ounce, infusion of senna, prepared with carraway seeds, or Epsom salts in drachm doses, frequently repeated, are well adapted. The purgative glyster, or even the emollient, is sometimes efficacious in relaxing the bowels; and when other means fail, recourse may be had to the fetid, the turpentine, or the tobacco glyster. The last is believed to be particularly well suited for removing constipation in cases of enteritic inflammation; and in several cases in which the symptoms resisted depletion, I have found great benefit from the repeated use of small tobacco *enemata*, prepared by infusing ten grains of the leaf with ten grains of aloes in eight or ten ounces of boiling water. In the employment of these remedies, it is to be remembered, that they are ineffectual so long as the inflammation is unsubdued, and that their influence begins to manifest itself as the inflammatory action abates.

3. The next class of remedies to be here mentioned consists of those which act on the skin, diaphoretics in general, opiates, the warm-bath, or local fomentations. The principle of their employment is easily understood.

During the whole course of the disease, a dry imperspirable state of the skin is partly an effect, partly an attendant circumstance, of the abdominal inflammation. It must not be concealed that this state of the skin is most readily, and in many cases most frequently, removed by the necessary evacuations of blood. In some instances, however, of abdominal inflammation, the effect of these evacuations is greatly increased by the seasonable exhibition of an opiate, so as to produce a diaphoretic effect. Thus, in cases of peritoneal inflammation, after twenty-five or thirty ounces of blood have been taken from the arm, so as to lessen the soreness and pain of the belly, and to leave the pulse soft and small, but as quick as before, the exhibition of forty drops of laudanum, or a grain and a-half of opium to an adult, will sometimes be followed by complete disappearance of pain, and a fall of twenty or thirty beats in

the pulse. It is indeed an objection to opium, that in any form it is too often followed by increased costiveness; but in this instance an ordinary dose of castor-oil or Epsom salts, after twelve or fifteen hours, will produce a copious feculent evacuation. Armstrong judiciously remarks, that opium, instead of constipating in *gastritis* and *enteritis*, tends to assist the action of purgatives; and when administered in conjunction with proper depletion, it may be regarded as a most powerful remedy. Thus, in some urgent cases in which previous blood-letting and purging had produced little or no alleviation of the symptoms, the efficacy of opium was remarkable; and in persons convalescent from fever, and attacked, while their weakness was extreme, with symptoms of gastritic or enteritic inflammation, a liberal dose of opium, given so as to relieve pain, was followed with the best effect. The patient falls asleep; and the pulse from being quick, small, and very weak, becomes full and slow; the skin becomes moist; and the whole system, from being irritable and restless, becomes easy, tranquil, and comfortable.

To the objection, that opium is often followed by increased constipation, henbane in extract and tincture is less liable; but it is so much less powerful than opium in lowering the pulse, and diminishing morbid sensibility after blood-letting, that it can rarely be used alone. Many, therefore, combine it with opium, with the view of counteracting the constipating effects of the latter.

Immersion in the warm or hot-bath is a very powerful remedy in cases of peritoneal or intestinal inflammation. It should never be used until after a considerable blood-letting. Its first effect is to relieve, sometimes entirely remove, the abdominal pain, and to determine the blood towards the surface and extremities. Afterwards it is generally followed by perspiration; and this should not be prevented, though not much encouraged. It is sufficient that the patient be not exposed to cool or moist air. Local fomentations have the same effect as the warm-bath, and should be used with the same cautions.

4. After speaking of the use of the hot or warm-bath and warm applications over the belly, it may seem singular to introduce the use of cold applications for the relief and removal of the symptoms of *peritonitis*. This remedy, however, has in certain cases and stages of peritoneal inflammation been followed by benefit so speedy and decided, that it deserves from the

practitioner particular attention. For the first knowledge of the effects of cold applications to the belly in cases of peritoneal inflammation, in modern times, we are indebted to Dr Sutton, who found that a cold lotion, consisting of equal parts of *Aqua Acetatis Ammoniae* and water, with half an ounce of rectified spirit in eight ounces, applied to the belly, was followed in the course of an hour or two with great alleviation of the pain, and in no long time with disappearance of the other symptoms. Among fourteen cases of peritoneal symptoms he employed this lotion after evacuation in ten, with gradual but complete disappearance of the pain, and final and speedy convalescence. In all these cases depletion, general and local, to a greater or less degree, sometimes a very considerable extent, had been premised; opiates had been exhibited, and the use of purgatives had been attempted. From these circumstances there is reason to believe that cold applications in the treatment of symptoms of peritoneal inflammation, are to be viewed chiefly in the light of auxiliaries, that they should not be employed previous to blood-letting or before a considerable impression has been made on the vascular system of the whole frame as well as of the inflamed parts, and that, employed under these restrictions, they are capable of abating and removing pain, allaying irritation, and producing contraction of the affected vessels. Dr Sutton eventually employed a lotion consisting of twelve ounces of camphor mixture, three ounces of solution of acetate of ammonia, and one ounce of rectified spirits.*

Much about the same time, (1813,) Mr T. Smith of Kingussie adduced four cases of peritoneal symptoms, in three of which the external application of cold water after the employment of blood-letting, was followed by cessation of the pain and heat of the belly, gradual disappearance of the vomiting and thirst, reduction in the frequency of the pulse, and eventual complete recovery.†

The therapeutic powers of cold applications were afterwards tried by Dr Abercrombie, both in *enteritis* and in *ileus*. (Ed. Med. and Surg. Journal, xvi.) I think they often operate by exciting the intestinal muscular coat to contract, by condensing the aerial matters contained within the bowel, and thereby

* Tracts on Delirium Tremens or Peritonitis, and some other Inflammatory Affections. London, 1813, p. 102-147.

† On the Effects of Cold Water given internally, or applied externally in four cases of Abdominal Inflammation. By Mr T. Smith, Surgeon, Kingussie. Edin. Med. and Surgical Journal, Vol. ix. p. 287, Edin. 1813.

restoring the peristaltic motion, and by exciting the dilated vessels to some degree of contraction.

5. Lastly, during the whole course of this disease all animal food, broths, soups, or fermented liquors should be strictly forbidden. The diet must consist solely of gruel, barley-water, with a little boiled barley now and then, toast-water, milk and water, with mint or common tea, coffee, or similar diluent liquors. It is also in general expedient to wrap the belly of the patient in flannel, which should be worn for some time, both during convalescence and afterwards. Great care should be taken to avoid exposure to any of the exciting causes for a long time, as the disease is apt to recur, after a short interval from the previous recovery, by exposure to cold or moisture. In several instances it has been known to recur the following autumn with less violence than at first. Yet though the pain be less severe, and the constitutional disorder less conspicuous, it is not less dangerous, and should be opposed with the same energy and promptitude as before.

6. In the chronic form, the treatment should be varied according to the slower and less violent nature of the disease. If the pulse be quick or hard, and the skin hot, blood should be taken from the arm to the amount of twelve or fifteen ounces. If there be merely soreness or pricking pain of the belly and whiteness of tongue, without much acceleration of pulse, six or eight ounces of blood may be taken once a week from the arm, or the same quantity may be removed locally by twelve or fifteen leeches applied to the belly, or by cupping. These measures should be pursued till the pricking pain has ceased, and the tongue has assumed a more natural appearance. With this view, also, the bowels should be moved at least once daily, occasionally twice, by castor-oil in draught, Epsom salts in suitable doses, infusion of senna, or the ordinary colocynth pill. At the same time, it is indispensable to forbid, entirely and absolutely, the use of animal food, soups, broths, and fermented or spirituous liquors, to enforce the necessity of rigid adherence to milk and vegetable diet, and to recommend the use of flannel clothing all over the person, but especially over the belly and trunk in general. Both patient and physician must persevere in these measures steadily and resolutely; for without this no good will result. (See Dr Black's Cases, p. 175.)

7. The analogy of ascites might favour the idea that puncture of

the abdomen and evacuation of fluid might be beneficial in certain cases of chronic peritonitis, in which the swelling and œdematous effusion indicate the presence of a considerable collection of fluid. To this it may be answered, that evacuation of such fluid is a mere remedy to an effect or symptom of the disease; and though in many instances it would doubtless be followed by alleviation of some of the symptoms, it is manifest that its benefit can never be permanent, so long as the original process of inflammation is unsubdued. I may refer to the work of Dr Baron for a case in which it was performed without any good effect. (P. 56.)

8. Black recommends highly calomel, combined with antimonial powder, and sometimes with opium, as an efficacious remedy; but he does not appear to have ascertained its merits by experience. In the trials made by myself of the use of calomel and opium in peritoneal disorders, I cannot say that I have seen greater benefit result than from the use of opium alone after suitable depletion.

§. V. Child-Bed Fever, Puerperal Fever, Denman, Hulme, White, Leake, Walsh, Gordon, &c. *Kindbetterinn Fieber*, German. *Metritis Puerperarum*, Sauvages, Sagar. *Hysteritis*, Vogel, Cullen. 'The Low Fever of Child-Bed, connected with affection of the abdomen, which is sometimes epidemic, John Clarke, London. *Peritonitis Puerperalis*, Forster, Hull, and Joseph Clarke. *Metritis Puerperalis*, Boivin and Duges.

Essays on the Puerperal Fever, and on Puerperal Convulsions, by Thomas Denman, M. D. London, 1768. Pp. 74.—A Treatise on Female Diseases, by Henry Manning, M. D. London, 1771. Chap. xx. of the Puerperal Fever.—A Treatise on the Puerperal Fever, wherein the Nature and Cause of that disease are represented in a new point of view, illustrated by Dissections, &c. &c. by Nathaniel Hulme, M. D. Physician (in ordinary) to the City of London Lying-in Hospital, &c. London, 1772. Pp. 175.—A Treatise on the Management of Pregnant and Lying-in Women, &c. &c. by Charles Whyte, F. R. S. London, 1772.—A Treatise on Child-Bed Fevers, and on the methods of preventing them, &c. &c. by Thomas Kirkland, M. D. London, 1774. Pp. 172.—Practical Observations on the Child-Bed Fever, also on the Nature and Treatment, &c. &c. by John Leake, M. D. Member of the College of Physicians, London, and Physician to the Westminster Lying in Hospital. 3d edition, 1775. 7th Dec. 1772.—Practical Observations on the Puerperal Fever, wherein the Nature of that disease is investigated, and a method of Cure, which has hitherto proved successful, recommended, by Philip Pitt Walsh, M. D. Member of the Royal College of Physicians, &c. &c. London, 1787. Pp. 59.—An Essay on the epidemic disease of Lying-in Women of the years 1787–88, by John Clarke, p. 43, 4to, London, 1788.—Observations on the Puerperal Fever, more especially

as it has of late occurred in the Lying-in Hospital of Dublin, by Joseph Clarke, M. D. Licentiate of Physic of the R. C. of Physicians in Dublin, &c. &c. Medical Commentaries, Vol. v. Decade ii. p. 299. 1790.—Practical Essays on the management of Pregnancy and Labour; and on the Inflammatory and Febrile diseases of Lying-in Women, by John Clarke, M. D. London, 1793. Pp. 170.—A Treatise on the Epidemic Puerperal Fever of Aberdeen, by Alexander Gordon, M. D. Physician to the Dispensary. London, 1795. Pp. 124.—An Essay on Phlegmatia Dolens, including an Account of the Symptoms, Causes, and Cure of *Peritonitis Puerperalis*, and *Conjunctiva*, &c. &c. by John Hull, M. D. Manchester, 1800. Pp. 362.—Hartwig, Dissert. de Febre Puerperarum. Goettingae, 1803.—Luc. Boer Naturalis Medecinae Obstetriciae Libri septem. Viennae, 1812. Lib. iv.—F. E. Naegele Schilderung des Kindbettfiebers, welches, vom Junius, 1811, bis zum, April 1812, in der Grossherzogl. Entbindungsanstalt zu Heidelberg geherrscht hat. Heidelberg, 1812.—Neubauer Dissert. de Febre Puerperali. Viennae, 1812.—Fiegl. Etwas zur naheren Bestimmung der Natur der Febris Puerperalis. In Horn's Archiv. per Med. Erfahrung. Jahrgang, 1813. Berlin.—Facts and Observations relative to the Fever commonly called Puerperal, by John Armstrong, M. D. 1st edit. 1813, 2d edit. Lond. 1819.—A Treatise on the Puerperal Fever, illustrated by Cases which occurred in Leeds and its vicinity, in the years 1809–1812; by William Hey, jun. Member of the Royal College of Surgeons in London, &c. &c. London, 1815.—Recherches Historiques sur la Fievre Puerperale, par A. J. Sedillot des Ternes, D. M. A. Paris, 1817. 4to.—A Treatise on the Epidemic Puerperal Fever as it prevailed in Edinburgh in 1821–22, &c. by William Campbell, M. D. &c. &c. Edinburgh, 1822.—A Treatise on the disease termed Puerperal Fever, illustrated by numerous Cases and Dissections, by John Mackintosh, M. D. Edinburgh, 1822.—Andeutungen und Bemerkungen zur Practischen Medizin, von Dr Hans Adolph Goeden. 1. Die Zwei Formen des Kindbetterinn Fiebers. Hufeland's Journal, liv. St. ii. 96. iii. 42. v. 80. Berlin, 1822.—Documents relative to the History of the Malignant Puerperal Fever which prevailed in the Lying-in Institution in Vienna, from the beginning of August to the middle of November 1819. Edin. Med. and Surg. Journal, Vol. xxii. p. 83. Edin. 1824.—Memoire sur le Rammollissement de l'Uterus, par S. G. Luroth, M. D. Repertoire Generale de l'Anatomie Pathologique, iv. 1. Paris, 1828.—A brief Notice of the disease popularly termed Puerperal Fever, by Samuel Cusack, A. B. M. D. &c. Edin. Med. and Surgical Journal, Vol. xxxi. p. 25. Edin. 1829.—De la Phlebite Uterine et de la Phlebite en general considerée principalement au regard de ses causes et de ses complications, par M. Dance. Archives Generales. Dec. 1828. vol. Feb. 1829.—Des Fievres Puerpérales Observées à la Maternité de Paris, pendant l'année 1829, &c. M. Tonnellé, Archives Generales, xxii. 345–346. Paris, 1830.—Resumé de la Clinique Medicale dans la Hopitale de Maternité de Paris, 1830. par A. Duplay. Journal Hebdomadaire, May 29, 1830.—Traité de la Peritonite Puerperale, par A. C. Baudelocque. Paris, 1830. 8vo.—Ruchgraths-krankheiten unter der form von Kindbettfieber und der Febris Novae Sydenhami. Beobachtet, von Jos. Hinterberger, Prof. der Geburtshulfe in Linz in Oesterreich ob der Enns. Hufeland and Osan's Journal, lxx. ii. St. p. 53. Feb. 1830.—Researches on the Pathology and Treatment of some of the most important Diseases of Women, by Robert Lee, M. D. &c. London, 1833. 8vo.—Traité Pratique des Maladies de l'Uterus et de ses Annexes Fondé sur un grand nombre d'Observations Cliniques, par Mad. Veuve Boivin et par A. Duges. Deux Tomes. Paris, 1833. 8vo. Tome Second, Sixieme Section, Chap. iii.—An Enquiry into the Pathology, Causes, and Treatment

of Puerperal Fever, by G. Moore, F. R. C. S. &c. London, 1836. 8vo.—
On Epidemic Puerperal Fever, by J. T. Ingleby, Birmingham. Edin. Med.
and Surg. Journal, Vol. xlix. p. 412. Edin. 1838.

It has been long known that females, soon after parturition, and even occasionally before it, are liable to be attacked by a febrile disorder, which, though in general attended with symptoms of great feebleness, oppression, and languor, and very often remarkable for its unmanageable and fatal character, appears under a variety of forms so great, as to have given rise to much discussion and inquiry at different periods among physicians, regarding its true and essential nature.

This disease, which, from the state of the persons in whom it appears, has been denominated Child-bed-fever [Kindbett-fieber] or Puerperal Fever, has most usually prevailed in general, more or less epidemically; has, on certain occasions, assumed the characters of an intense and well-marked attack of inflammation of the abdomen, more especially of the *peritoneum*, in others, of an attack of symptoms indicating the presence of inflammation of the womb, in others of a mere febrile disorder with marks of abdominal, and especially hypogastric uneasiness; and, in other circumstances, it has presented the aspect of an obscure and indistinctly marked disorder, with great feebleness and oppression of all the functions.

NOSOLOGICAL CHARACTERS AND POSITION.—In the early descriptions of the disease or diseases regarded as childbed fever, the symptoms were generally ascribed to some mismanagement in delivery, causing suppression of the lochial discharge, and to errors in diet and regimen, rendered more directly efficient by the distended and vascular state of the womb, the previous interruption of the menstrual secretion during pregnancy, and a supposed depraved state of the blood. Such, at least, appears to have been the opinion entertained by Raynalde, Sennert, La Riviere, De le Boe, Mauriceau, Boerhaave, Strother, De la Motte, Burton, and Cooper. No distinction was drawn between the remote and exciting causes of the distemper, and its pathological nature as a morbid action. A few indeed, as Felix Plater, Mercatus, and Tulpus, by admitting the circumstance of inflammation of the womb, attempted to refer the symptoms to some local disorder. Puzos imputed the symptoms to the presence of milk in various parts and organs of the body, in which he conceived it was distri-

buted by some aberration in the vital action. In short, the opinions entertained on the pathological nature of the disease, before the middle of the eighteenth century, were confused, contradictory, vague, and erroneous.

The first period at which physicians appeared to have attempted to frame any precise notions on its pathological character, was in the year 1746, when a formidable epidemic having appeared, and destroyed many puerperal females in Paris, —Jussieu, Col de Villars, and Fontaine, by whom it was witnessed, observed that the disease attacked only indigent women, and that it was neither so violent nor so general among those who were confined at their own houses, as among those who were delivered at the Hotel-Dieu, where scarcely one in twenty puerperal women recovered. In this epidemic it was ascertained that the appearances found at inspection were a substance, which they called coagulated milk, attached to the external surface of the intestines (albuminous exudation in the uterine and intestinal peritoneum,) copious effusion of milky serosity, *i. e.* sero-purulent or purulent fluid in the pelvic peritoneal cavity, bloody extravasation at the free apertures of the Fallopian tubes, and, in several instances, suppurative disorganization of the ovaries. (*Histoire de l'Academie Royale des Sciences*, 1746, 4to, p. 16.)

In the spring of the year 1750, the disease made its appearance in the Hotel-Dieu of Lyons, and produced great havoc by sero-purulent effusion, as well as the affection of the substance of the womb. M. Pouteau, to whom we owe this transitory record, regarded it as an epidemic erysipelatous inflammation of the peritoneum, the fatality of which, he assures us, made him mourn for the sufferers whom he was unable to relieve. (*Mélanges de Chirurgie*, p. 180–182.) He found the omentum thickened and contracted; presenting several points of purulent matter, adherent by exudation to the muscular peritoneum; the intestines distended with air, and their peritoneal coat reddened; and the womb bulky, with its walls red and soft, and its inner surface soft and blackish.

Sauvages, chiefly on the authority of Sennert and Mauriceau, referred the disease to the head of inflammation of the womb (*Metritis*), of which he distinguished three forms, the puerperal, the typhoid, or that complicated with malignant fever, and the milky or that from suppression of the mammary secretion; the

first and third, however, equally inflammatory in nature and tendency

In 1770 there appeared in the hospital of St Mark at Vienna, a puerperal epidemic, which Storck regarded as inflammatory; and the disease continued to prevail in the same city for the two ensuing years with great fatality,—with considerable abdominal swelling and pain in the hypogastric region; and on inspection after death, the intestines were found covered by false membrane; and several *viscera*, and among others, the womb, bore marks of inflammation and gangrene.

About the same time the disease which had originally been noticed by Strother (1718,) and Burton (1751,) in England, began to attract particular attention. Dr Denman, the first English author, (1768,) who gave an express account of it, does not appear to have formed any very decided opinion of its nature. He speaks indeed of the inflammation of the womb, of the tenderness and pain of the *os internum*, and of the signs of inflammation preceding those of putridity. But he admits that he never had an opportunity of examining the body of any one who died of this disease, and, adopting the appearances mentioned by Lieutaud, as accordant with the result of later dissections, is satisfied with saying that the milky matter (*materia lactea*,) with which the intestines were said to be covered, is probably an inflammatory exudation, (p. 39.) Dr Manning, who wrote shortly after (1771,) like most authors of the day, confounded the pathological or proximate cause with the remote causes, and ascribes all its phenomena to the putrid tendency of the humors. Hulme (1772,) and Leake (1772–77,) the next authors who treat of this disease, differ not materially in their idea of its pathology. The former regards its immediate or pathological cause to be inflammation of the intestines and omentum; and appeals in support of this to various dissections in which the omentum was more or less reddened, thickened, and contracted, the outer or peritoneal coat of the intestines glued together by parcels of a whitish or yellow fatty substance, which is manifestly the coagulable lymph of later authors, and much yellow fetid liquor mixed with purulent matter, was found in the abdominal cavity, or in the pelvic region. (Dissections, p. 35–56, and chap. vi. p. 147.) Leake remarks the same appearances in his 5th, 8th, 10th, 11th, 13th, and 14th cases; and states that “the *omentum* is the part generally affected, being either almost

totally consumed and melted down into a thick curd-like pus, or partially suppurated and inflamed; that this inflammation often overspreads the surface of the intestines, (the *peritoneum*); and that a large quantity of purulent whey-coloured fluid was also found in the cavity of the abdomen and pelvis, mixed with small clots of blood and curd-like matter." (Introduction, p. 9.) White remarks, "that in the cavity of the abdomen is generally found an extravasated serum mixed with purulent matter, and an exudation appears upon the surface of the intestines, gluing them to one another, and to the peritoneum." (p. 21, 23.) Yet he says, "it does not appear that this disorder can be ascribed to simple inflammation," but speaks of "a putrescent disposition of the intestines;" and is afterwards at great pains to prove that the same effects take place in fatal fevers of the putrid or malignant class, and that they are the effects, rather than the cause of the disease.

Kirkland (1774,) who published his essays as a supplement to the writings of these authors, takes a sort of middle course, and, regarding puerperal fever as a disease arising from sundry different pathological causes, inflammation of the womb, of the abdominal viscera, absorption of putrid blood or other matter in the womb, coming of the milk, inflammation of the breasts, absorption of acrid milk, and retention of excrements, (p. 90,) concludes that inflammation of the womb and consequent absorption of putrid matter will bring it on, and that inflammation of the abdomen is frequently the consequence of the fever thus induced (67.) He believes, however, that inflammation of the contents of the abdomen is *sometimes* the cause of child-bed fever; but thinks this is the case in very quick labours only, where the quantity of water was large, and the womb emptied by hasty delivery as soon as the membranes broke, without taking care to make immediate pressure on the belly (p. 70.) Pitt Walsh (1787,) the next in succession, regards it as an unusual form of a very common disease,—infectious fever complicated with more or less extensive inflammation of the peritoneum (p. 14),—an opinion which he adopts chiefly on the ground of its alleged contagious propagation and its prevalence at the same time, and in the same places with continued fever.

An epidemic in the Hotel-Dieu of Paris in 1774 and 1775, contributed again to instruct physicians in the morbid anatomy

of the disorder. In the cases inspected, the intestines, especially the *ileum*, were found inflamed and mutually united by albuminous exudation; their interior distended by air, yellowish fluid matter, and sometimes containing worms, of the genus *Strongylus*, and the womb in general sound.

An instructive account of the necrotomy of puerperal subjects appeared in 1788, in the writings of Dr John Clarke, of the General Lying-in Hospital of Store-Street, London, who described the epidemic of 1787–88, and subsequently republished his observations in a more complete and enlarged form in 1793. In the latter work, although he attempts, rather unsuccessfully, to distinguish inflammation of the *peritoneum* from the *low childbed fever sometimes epidemic*, we find sufficient evidence to prove the true nature of the disorder. Thus he allows, that, in the greater number of cases, a collection of fluid is contained in the general cavity of the abdomen, sometimes very large in quantity, amounting to several quarts. Though resembling serum mixed with purulent matter, it differs from both in this respect, that it is not homogeneous, but mixed with portions of solid matter, the same as is found on the surfaces of the *peritoneum*. He remarked the peculiar smell of this fluid, which distinguished it from any other met with in the human body, either in health or disease. Where it was in large quantity, all the surfaces of all the *viscera* and of the *peritoneum*, generally, were found covered with a crust formed of the solid part of this matter, resembling coagulating lymph. Its particles cohered but slightly, so that by a little agitation it mixed with the fluid matter. The parts, however, lying under this coat or crust were not always inflamed. If there were any interstices between the intestines, or the other viscera of the cavity of the abdomen, they were frequently filled with large masses of the same, making an accurate cast of such interstice.

The quantity of fluid extravasated, and of the solid part floating in it or encrusted, even when the disease was of short standing, he thought bore no proportion to the degree of inflammation, or the extent of inflamed surface. He allowed that, in most instances, there had been some slight degree of inflammation in some part of the cavity of the abdomen, but it was not confined invariably to any particular part. Sometimes the peritoneal surface of the intestines, sometimes that of the stomach, sometimes that of the liver, and sometimes the peritoneum

lining the muscles, were found partially inflamed. The *uterus* and *ovaria* (peritoneal coat) sometimes partook of the inflammation, but not more frequently, or in a greater degree than other parts. The inside (mucous surface) of the *uterus*, or of the intestines, was not found to be inflamed in any of those whom he had an opportunity of examining after death, nor did he find any signs of gangrene or mortification. (135—137.)

Dr George Pearson of St George's Hospital submitted the fluid found in the abdominal cavity to chemical analysis, and concluded that it appeared to be a mechanical mixture of a slightly coagulated matter, and a fluid like serum in many properties, in the proportion of one part of the former to sixty-three of the latter. But as to the difference in qualities between this seemingly coagulated matter, and the coagulable lymph of the blood and lymphatics, caseous matter, purulent matter, mucus, and other animal mucilages, he could not distinguish without farther experiments. (143.)

The appearances here enumerated are manifestly the result of inflammation of the *peritonæum*; and whatever objection may be derived from the circumstance of the redness being inconsiderable, and by no means general after death, it cannot be denied that a sufficient proof of the existence of the inflammatory process during life is found in the effusion of lymph, sero-purulent fluid, or purulent matter. Accordingly, this idea of the pathology of puerperal fever has been adopted by several practical physicians, who have studied the necrotomy of the disease, since the time of Dr John Clarke; and we find that, about the same time, Dr Joseph Clarke of Dublin, Dr Gordon of Aberdeen, and Dr Hull of Manchester, agreed in considering it as inflammation of the *peritoneum*; and that, more recently, the same views were taken by Mr Hey of Leeds, Junior, and Dr Armstrong of London. "The most probable supposition," says Joseph Clarke, "which has been hitherto made of the proximate cause of this disease is, that it consists in an inflammation of the *peritoneum*." (26.) "It may be considered as an established truth," says Gordon, "that the puerperal fever is a disease of an inflammatory nature." (54.) "The proximate cause of puerperal fever," says Hull, "is an inflammation of the *peritoneum*, occasioning an increased effusion of fluid into the cavity of the abdomen." (§. 4, p. 259.)

Wherein, then, does it differ from common inflammation of

a serous membrane, from acute *peritonitis* already mentioned? This question, which is sufficiently natural, was in some degree anticipated by John Hunter, and has been more fully elucidated by Gordon, and especially Hull of Manchester.

I have shown (p. 159) that Hunter regarded the puerperal peritoneal as a spreading or diffusive inflammation, in which the tendency to effusion of lymph, adhesion, and limitation is less strong than to effusion of fluid, and general dispersion over an extensive surface. It is in this view that Gordon, like Hunter, thought it analogous to erysipelatous inflammation, and that Hull tried to find a resemblance between it and the swelled leg (*phlegmasia dolens*) of puerperal women. "Numerous dissections have shown that the inflammation is rarely confined to a small portion of the peritoneum. Instead of being circumscribed like phlegmon, it extends itself like erysipelas, and is generally diffused over a very considerable part, and sometimes over the whole of this membrane,—not only as lining the cavity of the abdomen, but as elongated into the omentum, mesentery, ligaments of the uterus, and as reflected over the uterus, bladder, intestines, and other viscera. Instances even are not wanting, where the cavity of the thorax has become affected in a similar manner in this disease." (p. 260.) This opinion is confirmed by Mr Hey Junior, who admits, that, wherever the inflammation begins, it rapidly extends to all the contents of the abdomen. In short, all that has been ascertained by the researches of the most diligent and impartial inquirers on this subject, tends to establish the conclusion, that an important character of puerperal fever consists in spreading or diffusive inflammation of the *peritoneum*, in which the inflammatory action spreads rapidly over a great extent, sometimes the whole of the membrane, affecting its smooth or secreting surface only, and in this manner giving rise to the serous, sero-purulent, or purulent effusion, according to circumstances.

But though inflammation of the uterine peritoneum be an important part of child-bed fever, it does not constitute the whole of that disorder. Various morbid changes are also found in the womb, the ovaries, and the Fallopian tubes.

Dr John Clarke had remarked that the womb, though commonly found firm in substance, is larger than when naturally contracted, and that, upon dividing it, purulent matter is often

found in its large veins, indicating the previous existence of inflammation of these vessels. The same observer found the ovaries and the Fallopian tubes loaded with blood, the former distended with matter to the size of a pigeon's egg, and the cavity of the latter filled with the same fluid. Though Dr Clarke has been misled by his fancy of distinguishing inflammation of the womb and ovaries, and inflammation of the *peritoneum*, occurring in childbed, from the Low Fever of childbed, sometimes epidemic, yet he must be allowed to have given the first general and clear account of the several lesions taking place in this disease, and its comprehensive character in attacking at once so many different tissues.

Since the time of Clarke, various researches, upon a scale more or less extensive, have been made on the morbid anatomy of this disease, by Boer, Naegele, Neubauer, Fiegl, and Goeden, in Germany; by Luroth, Danyau, Dance, Duplay, and Tonnellé, in France; and by Drs Lee and Cusack, and Mr Ingleby, in Britain; and of these researches the general result is to show that the symptoms called Puerperal Fever consist either in inflammation of the uterine and general *peritoneum* (*Peritonitis uterina*; *Metro-peritonitis*); or in inflammation of the womb (*metritis*); ovaries, (*Oophoritis*); Fallopian tubes, (*Salpyngitis*); and uterine veins, (*Phlebitis uterina*); or in more or fewer of them combined.

A short view of the results obtained by the researches of these different inquirers will most readily furnish correct ideas on the anatomical characters and pathological nature of the disease.

A. It appears, in the first place, that more or less inflammation of the peritoneum is a very constant character of puerperal fever. Thus of 222 cases examined by M. Tonnellé, in 193 were traces of peritoneal inflammation observed. These consisted in more or less redness of the peritoneal tunic of the intestines, or of the mesentery, omentum, or uterine *peritoneum*, sometimes with thin albuminous exudation, sometimes with copious effusion of opaque sero-albuminous fluid.

Alterations of inflammatory character and effects were observed in the womb and its appendages in 197 cases, which, though only four more than those of the *peritoneum*, must be regarded as indicating that in this organ the morbid action is equally common, at least, as in the *peritoneum*. It is to be ob-

served, however, that in this estimate, the lesions of the womb are not distinguished from those of the ovaries and Fallopian tubes, which always assume a conspicuous place in the morbid appearances found after death by puerperal fever. From one part of the report it appears that inflammation of the ovaries was observed in 58 cases, and suppuration of these bodies in four, making a total of 62; and from another statement it appears that inflammatory lesions of the ovaries were found in 99 cases. Taking only the smallest of these numbers, it would give for affections of the womb proper the number of 135, including inflammation and suppuration of the Fallopian tubes, for distinguishing which M. Tonnellé's statement furnishes no data, except in the circumstance, that the number of cases of simple uterine inflammation is stated to have been 79.

The inflammation of the womb in puerperal fever may affect either its peritoneal covering and external surface with the subserous cellular tissue, or the inner surface, or the substance of the organ.

When it affects the external or abdominal surface of the womb, besides the albuminous exudation on the peritoneum, which is generally most copious at the *cornua* or angles, and in the angle between the bladder and womb before, and that between the womb and *rectum* behind, the subserous cellular tissue presents more or fewer minute specks, patches, and masses of purulent matter, mostly separate and disseminated over its surface, but sometimes collected in one or two large abscesses. In either instance the uterine peritoneum is elevated in the form of a *phlyctæna*, or large vesicle, by the presence of sero-albuminous or sero-purulent fluid interposed between it and the surface of the womb. These vesicles Madame Boivin states she has seen as large as peas, and varying from that to the size of a pigeon's egg. The infiltration of purulent matter is observed sometimes to extend into the cellular tissue of the pelvis, and even into that of the *peritoneum* of the abdominal muscles.

B. METRITIS MOLLESCENS. PUTRESCENTIA UTERI; Boer.—The inner surface of the womb is found in various states, the difficulty of accurately distinguishing which, arises from imperfect knowledge of the normal state of that surface after the process of parturition. It is known that after the expulsion of the fœtus and after-birth, the vessels to which the latter was attached are not closed so immediately as to prevent all

bleeding; and that a sanguine or sero-sanguine liquid continues to ooze for several days from that part of the uterine surface to which the placenta had been attached. As the womb contracts and shrinks in size, its sinuses also shrink and expel from their interior the blood still left within them at the moment at which the placenta is detached. The blood thus expelled, followed afterwards by sero-sanguine exudation and serous fluid, constitutes the *lochia*, or lochial discharge. In the normal state it is never either copious or pure blood, as the progressive contraction of the uterine walls, with a particular contrivance observed by Dr Lee at the open mouths of the veins, counteracts the occurrence of hemorrhage, properly so named. In the womb of a female a few days after delivery, the orifices of the sinuses are observed to be of a semilunar shape, and forming an oblique angle with the surface of the *uterus*; wherever they are uncontracted, they are closed by portions of clotted blood or coagulable lymph, which adhere with more or less firmness.

From various causes, however, connected with the imperfect contraction of the womb, or the detachment or imperfect adherence of the clots, the lochial discharge may continue longer to be sanguineous in some individuals than in others. During the whole of this time also, the inner surface of the womb, especially where the placenta was attached, is of a dark-brown colour, loose and flocculent, and covered with a dark reddish-brown semifluid coating, which exhales an odour sometimes mawkish and slightly fetid, sometimes actually offensive and gangrenous. When this coating is removed by washing, the surface is of a dark-red colour, tending to brown, irregular and granular, emitting a faintish heavy odour, but not softer or less consistent than natural.

The consistence, however, not only of the inner surface of the womb, but also of its substance, may be perceptibly, nay remarkably, diminished; and when this change is associated with the dark-red or brown colour and fetid odour, it indicates the presence and effects of a peculiar disease of the uterine substance, to which the name of Softening or Mollescence, and Putrescence of the womb has been applied.

This was first accurately distinguished as a specific disease of the womb, and described in 1792 by Lucas John Boer, Professor of Midwifery at Vienna, after he had observed va-

rious examples of it, which convinced him that the change in consistence was an essential and specific lesion of the womb, which had been previously overlooked, or confounded either with the miliary puerperal fever, or with puerperal fevers generally.* It then became the subject of a dissertation by Kaiser at Jena, in 1810;† by Zimmermann, at Leipzig, in 1815;‡ by Locher, at Berlin, in 1819;§ and was treated by Joerg, in his obstetrical writings in 1818. At a subsequent period it was the subject of Inaugural Dissertations by Lippich|| at Vienna, and Gustavus Frederic Schmidt, at Gottingen, in 1825;¶ an able memoir, by M. S. G. Luroth, in 1828;** and a Dissertation by M. Danyau;†† and since that time observations have been published on the subject by Dr Lee in this country, and Madame Boivin and M. Dugès in France.

According to Boer, this putrescent softening of the womb is peculiar to the period of pregnancy or childbed. It attacks first and principally the orifice and neck, and the inner surface of the womb, and may thence spread both over the whole surface, and into the substance of the organ to the depth of some lines. The womb is not only more bulky than it ought to be, considering the period after delivery, but also more flabby and soft; and its walls are thickened, and of a spongy structure. The external surface of the womb is sometimes of a uniform dirty white; sometimes speckled with livid leaden-coloured spots, or arborescent vascular figures, with red patches,—the marks of inflammation of the uterine peritoneum. The substance of the womb is more or less softened, friable, or lacerable between the fingers; in some cases with the appearance and consistence of putrid fruit, and of a colour pale, livid, or blackish. The inner surface, which is still more softened than the rest of the organ, and sometimes ulcerated, is covered with

* *Abhandlungen und Erfahrungen geburtshülflichen Inhalts*, Wien, 1793, B. iii., and Dr Lucae Joannis Boeri, *Naturalis Medicinæ Obstetricæ*, Libri septem. Viennæ, 1812. Lib. iii. p. 176.

† *Dissertatio de Sphacelo Uteri Gravidæ, observationibus illustrata*, in 4to. Jenæ, 1810.

‡ *De Putrescentia Uteri*. Lipsiæ, 1815, 4to.

§ *De Putrescentia Uteri*. Berolini, 8vo, 1819.

|| *Observata de Metride Septicâ*. 8vo. Vindobonæ, 1823.

¶ *De Putrescentia Uteri*. Gottingæ, 8vo, 1825.

** *Memoire sur le Ramollissement de l'Uterus*. in *Rep. Gen. d'Anatomie et de Physiologie*, v. Paris, 1828.

†† *Essai sur la Metrite Gangreneuse*, par A. Danyau. Paris. 1829.

a layer of viscid matter, putrid, of a black, brown, or gray colour, and exhaling a very fetid odour. This matter, which is easily removable by scraping with the knife, proceeds from the residual fragments of the after-birth, mingled with the product of the lochial secretion,—passing rapidly to decomposition. This, however, may be present when the texture of the womb is sound; and it must not, as has been done by careless or unskilful observers, be then regarded as a sign of putrefaction.

The tissue of the womb is in general changed to the depth of two, three, four, or six lines. At the place where the placenta has been attached, the mollescent change is in general deepest; and at this point Boer found, in some instances, condensed flocks of the after-birth so adherent to the womb, that they could not be detached without laceration. But the neck of the womb is always most deeply affected; and sometimes the *os tincae* is altogether destroyed. Sometimes it attacks the vagina; yet occasionally, especially if the head of the infant has remained in it but a short time, the latter canal remains uninjured.

In some cases, the anterior wall of the womb is softened and attenuated to such a degree, that the slightest force causes it to give way. This constitutes *Atrophy* of the womb.

In a considerable proportion of cases, the ovaries and Fallopian tubes partake, in different degrees, of the same change. They may be merely bluish on the one side, or entirely sound; but, in other instances, they are softened, and their characteristic structure is altogether destroyed.

In most of the cases inspected by Boer, the peritoneal coat of the intestines presented marks of inflammation, and a copious effusion of milky serous fluid was contained within the peritoneal cavity. In most cases, other inflammatory effects were recognized within the cavity of the chest.

On the nature and origin of this peculiar change in the substance of the womb, the opinion of the most experienced observers has varied much. Boer attributed its occurrence to corruption or putrefaction of the *decidua vera*; but as he relates cases in which the putrid layer was found within the Fallopian tube and ovary, it is clear that this cannot be the true source of the evil. He thinks it cannot be regarded as an inflammatory disorder, because though inflammatory symptoms are present at first, yet these are so rapid in progress and ma-

lignant in character, that they must be regarded as different from true phlegmonous inflammation; and to these he adds the observation, that antiphlogistic measures do not produce effectual or permanent relief.

These arguments are not conclusive. The inflammatory process varies so much in its nature and effects, that no just conclusion can be deduced either from the rapid progress of the disorder, its pernicious and disorganizing character, or the influence of remedies. It is hence partly that, though the opinion of Boer is espoused by Joerg and most of the Germans, as Zimmerman, Wenzel, Schmidt, it is rejected or modified by Pfeuffer, Wenzel, Luroth, Danyau, Desormeaux, and Tonnellé, all of whom allow that inflammation performs some part in the process. Luroth, for example, concludes that it is preceded or accompanied by a peculiar species of inflammation, which has a tendency to rapid disorganization, and which resembles those forms admitted by pathologists, called asthenic, putrid, septic, and venous, and that, though this species of inflammation may be often the principal cause or an auxiliary of its presence, yet softening may be developed without previous symptoms of inflammation. Desormeaux and Tonnellé have well observed, that the most important part of the inquiry is not, whether the disease be the effect of inflammation, but whether the inflammation be accessory and secondary, or essential and fundamental. Desormeaux appears to have considered uterine mollescence as the effect of uterine inflammation, (*metritis*.) Tonnellé is disposed to consider the inflammatory state as a phenomenon quite accessory, or a species of veil which conceals the true efficient cause of the disorder. Duplay also observes, that in those cases of mollescence in which inflammatory symptoms were absent during life, and in those, in which after death softening of almost all the viscera, and especially of the womb, was observed, with universal diffuence of the blood, he always found, notwithstanding, several traces of genuine uterine inflammation. Thus in bodies inspected under the circumstances specified, if there were not purulent infiltration, there were serous infiltrations; and the pathological analogy of the disorders he further regards as proved by the simultaneous presence of purulent matter in the lymphatic vessels, and the lumbar lymphatic glands.

Boer, Luroth, Tonnellé, Danyau, and Duplay, and indeed all who have considered this lesion, have carefully and decid-

edly distinguished it from mere simple gangrene of the womb. Tonnellé and Duplay especially have remarked that mollescence, or the change named putrescence of the womb, differs particularly from gangrene in this respect, that it diminishes progressively, and is insensibly lost in the sound structure of the organ, whereas gangrene is in all cases limited and circumscribed by definite boundaries. Tonnellé remarks that mollescence is distinguished by presenting different degrees, which in gangrene cannot be recognized. Duplay describes patches of mortification in the womb, which he represents to be circumscribed, and similar to those produced by the application of caustic potass, and which he most usually found in the *cervix* of the womb, and sometimes towards the upper angles of the body of the organ; and similar dead sloughs appear to have been met with by Madame Boivin.

These diagnostic marks are less unequivocal than they at first sight appear. It may be admitted that mollescence of the womb is not exactly the same lesion with circumscribed gangrene of the organ, without proving that, therefore, mollescence is not a species of gangrene. It may indeed be a species of acute spreading, mortifying, or gangrenous inflammation, analogous to that which is observed to attack the cellular tissue and the muscles in certain circumstances.

Other two questions regarding the nature and origin of this species of degeneration have been proposed by Madame Boivin and M. Dugès.

The first is suggested by the fact, that this softening of the uterine substance was observed by Danyau and Tonnellé, and also Madame Boivin, to coincide with softening of the spleen, the lungs, and other parenchymatous organs, and to occur after well-marked symptoms of a typhoid affection. The authors therefore propose the question, whether this softening was the cause or the effect of the typhoid symptoms, and whether there is no analogy between the uterine softening and various instances of softening of the stomach and spleen, the inflammatory nature of which is by no means established. If these notions be well founded, as it seems to be proved that the softening of the stomach, lungs, spleen, and heart depends on the congested state of the circulation and the slow motion of the blood within their organs, producing excessive distension and separation of their component tissues, it seems most natural to think, that softening of the womb is also the effect of over-distension

and extreme vascular congestion. To imagine that it can proceed from unusual vacuity of the vessels, or a state the reverse of congestion and distension, seems to be completely at variance with all the best established facts in physiology and pathology.

The second point suggested by Madame Boivin and M. Dugès deserves attention, not only from its reasonableness, but because it is inconsistent neither with the last mentioned view, nor with that which ascribes softening to the effect of inflammatory action. From the circumstance of finding occasionally in the bodies of females destroyed by the symptoms of puerperal fever, purulent matter in the substance of the womb, nearer, indeed, the exterior than the interior surface, occasionally collected in masses, sometimes disseminated or infiltrated between the muscular fibres, they think it probable that it may at some future period be requisite to admit, that partial softening is only the first period of phlegmonous or suppurative uterine inflammation, (*metritis phlegmonoides*,) infiltration the second, and the formation of abscess or purulent collection the third; and that softening is generally peculiar to recent and intense attacks of *metro-peritonitis*, and abscess to those of more chronic character, or in which, the individual having survived the acute stage, the disorder had assumed its chronic form. In confirmation of the justice of this view, they observe, that they have seven or eight times witnessed purulent collections in the substance of the womb in females, who seemed cured of a very serious attack of *metro-peritonitis*, but who sunk during convalescence under an attack of *pleuro-pneumony* or *hydrothorax*; and the peritoneum then presented only few traces of the past inflammation.

C. UTERINE *Phlebitis* OR UTERO-VEINUS INFLAMMATION.—The presence of purulent matter within the uterine veins, in the bodies of females destroyed by puerperal fever, was observed by Dr John Clarke in 1793.* About the same time it was observed by Meckel, whose case was published by George William Sasse in his dissertation in 1797, at Halle†; and both agree with J. Hunter in ascribing the fatal result of cases of

* Practical Essays on the Management of Pregnancy and Labour, &c. By John Clarke, M. D. London, 1793. Essay V. Section II. p. 69. "Upon cutting into the substance of the uterus, pus is often found, which in all the cases I have met with, is situated in the large veins of that part."

† De Vasorum Sanguiferorum Inflammatione. Auctore J. Geo. Gul. Sasse, M. D. Halae, 1797. Brera Sylloge iii. 143.

this class to the purulent matter being conveyed into the circulating current and thence to the heart. The lesion has since that time attracted the attention of Chaussier, Ribes, Louis, Dance, Tonnellé, Danyau, Lee, and Arnott; and the general result of the researches of these inquirers is to establish the fact, that it is not only a frequent occurrence in the bodies of puerperal females, but that it is a principal cause of the unmanageable character and fatal termination of the disorder. Purulent matter was found by Tonnellé within the veins of the womb in 90 among 222 cases, or about the proportion of two-fifths of the whole number. Among 45 cases of fatal puerperal fever in London, Dr Lee found inflammation and suppuration of the uterine veins in 24 cases, or more than one-half.

Uterine venous inflammation is observed chiefly, if not solely, after delivery, when the uterine veins, after being much enlarged during pregnancy, cease to be connected with the placenta. It usually begins at the orifices of the uterine sinuses exposed by the detachment of the after-birth, nearly as, in the case of amputation, in the veins of an extremity. At this point the marks of inflammation are usually deeper than in any other part of the womb, and in some cases they are observed at this point alone. Hence the inflammation extends progressively to the innumerable veins which wind through the *parietes* of the womb; and as these veins are intimately attached to the tissue of the organ which embraces them on all sides, venous inflammation becomes in some sense parenchymatous, and is usually complicated with uterine inflammation. According to Tonnellé, it was rare to observe the commencement of uterine venous inflammation towards the placental insertion.

Conversely, venous inflammation may ensue on internal uterine inflammation; and though, in these circumstances, the veins are most usually the seat of suppuration, it is not uniformly correct to say, that purulent matter may be then infiltrated or collected in minute abscesses in the substance of the womb. M. Dance records in his dissertation several cases justifying this opinion; and in one case he found the half of the body of the womb infiltrated with purulent matter, and containing in various points small abscesses. The only point here for consideration is, whether these minute abscesses are not purulent collections in the smaller veins; as to which M. Tonnellé ob-

serves, that it is impossible to divide any part of the womb without observing purulent matter exuding in the form of innumerable little drops, which correspond to the orifices of the divided vessels. In some instances, these minute abscesses may be traced to the course of lymphatics. In this manner, therefore, *metritis* and uterine *phlebitis* are most frequently combined; but sometimes the one, and in other cases the other, disorder predominates. In the cases recorded by M. Tonnellé both were combined in 32 cases; uterine venous inflammation was associated with *peritonitis* in 34 cases; and in 8 cases only among 90 was venous inflammation the sole lesion.

Venous inflammation, though commencing in the womb, may extend beyond the limits of the walls of that organ, pursue the direction of the uterine veins furnished by the hypogastric, and more frequently ascend along the interior of the ovarian veins, and sometimes even spread into the inferior *cava*, and the other veins of the abdomen. I have seen purulent matter extending from the uterine veins of the right side, not only into the hypogastric, but into the common iliac veins and *vena cava*. Marks of inflammation of the veins are then usually found in the substance of the ovaries, of the round ligaments, and along the course of the Fallopian tubes; for these veins communicate, directly or indirectly, with the uterine veins in which the evil has originated; and with this venous inflammation is almost constantly conjoined a degree of swelling or a bloody enlargement, and occasionally suppuration in the substance of the ovaries and round ligaments. When the veins exterior to the womb are inflamed, those of the uterine walls are almost always so at the same time; and it may then be certainly inferred, from the fact of the continuation of the one to the other, that the inflammation originated in the womb. It may nevertheless happen, that, while the inflammation ceases or declines in the uterine veins, and continues or makes new progress in the abdominal veins, traces of very great mischief are found within the latter, while the former present little or no alteration. This appears to have been the case with the instance recorded by Mr Wilson. It does not follow, however, from facts of this nature, that the disease did not begin in the womb itself.

Though inflammation may affect the whole of the venous tubes of the womb, it is very often more or less strictly con-

fined to those of one side of the organ; and it is then said to be unilateral. This peculiarity, which was often observed by Dance, and sometimes by Tonnellé, is ascribed by the former to the variations observed in the point of insertion of the after-birth. If this body have been fixed more to one side than to another of the womb, its detachment leaves exposed a surface containing veins and sinuses, which communicate most directly with the veins of that side; and if in these inflammation commence, it may be more expressly confined to them. This isolation of *phlebitis*, however, is not observed so strikingly in the veins contained within the uterine walls. To illustrate this, M. Dance observes that, among eight cases, inflammation extended in three to the two ovarian veins at the same time, in one case to the left ovarian vein, and in four cases to the right ovarian vein exclusively. From this it follows that the veins of the right side of the womb appear to be more exposed to inflammation than those of the left side; and he thinks that this again is to be referred to a circumstance, which he believes to be confirmed by the results of examination of the dead body, as well as auscultation employed to determine the site of the *placenta* during pregnancy in the living,—that this body is more frequently attached to the right than to the left side of the womb. In the majority of these cases the ovary and round ligament presented bloody congestion and suppuration within the veins, on the side corresponding to the inflamed ovarian vein, consequently more frequently on the right than on the left side, and on one side alone than on both sides at once. In the same number of cases, viz. eight, the hypogastric veins were found inflamed only three times, more frequently on one side than on both, and on the right than on the left side, as the ovarian veins.

One of the most singular and important features in the history of *phlebitis* is the frequency with which it is accompanied or followed by secondary purulent deposits in various situations and organs of the body remote from the veins originally attacked. This secondary suppuration has been observed to be frequent in the case of uterine *phlebitis*. Purulent collections have been formed within the *pleura* or the substance of the lungs, most probably within its venous tubes, within the *pericardium*, within the liver, within the *pancreas*, in the filamentous and adipose tissue, in the substance of the muscles,

and, lastly, within the articulations. The relative frequency of these purulent collections, in different regions, it is not easy to determine with precision. But, from the numerical statements given by M. Tonnellé, they seem to be most common within the *pleura*, in the lungs, in the muscles, within the articulations, especially the knee-joint, in the filamentous tissue, in the liver, and in the pericardium, in the order now specified.

In some instances, probably where life had not been continued sufficiently long, instead of purulent matter, the muscles and the articular tissues were found merely much congested with blood, or the lungs and liver were found inflamed.

It must not be imagined, nevertheless, that the presence of purulent matter within the veins of the womb or the neighbouring vessels always denotes the presence of venous inflammation. Madame Boivin and M. Duges have well remarked, that, in a certain number of cases, the interior of the veins is smooth, and not red or villous, and the venous tissue itself not thickened, and in these cases they, with M. Duplay, doubt the existence of inflammation, and ascribe the presence of purulent matter in the interior to direct absorption. This view is so much more probable in certain cases, in which the interior surface of the womb is covered with purulent matter, that the same fluid is also found within the lymphatics without these vessels being inflamed. It appears, indeed, that M. Tonnellé and M. Nonat have, probably in their zeal to generalize extensively, been disposed to find proofs of inflamed lymphatics much more frequently, than they are actually known to take place.

In other respects it must be allowed that, whether the purulent matter found within the veins and lymphatics be the product of inflammation of these vessels, or only conveyed into them by absorption from the womb, the effect is quite the same upon the economy. The purulent matter conveyed into the circulating system with the blood is the manifest cause of the symptoms of languor, oppression, and mortal sinking, which are uniformly observed in this fatal disorder; and if it be not conveyed to the different tissues and organs in which it is afterwards found, it must at least be allowed to be the most probable cause of these secondary purulent deposits and collections.

In a small proportion of cases more or less serous fluid was

found within the *pleura*, *pericardium*, and in the cerebral ventricles.

D. LESIONS IN THE OVARIES AND FALLOPIAN TUBES. *Ovaritis Oophoritis*.—In cases of puerperal fever, inflammation indicated by enlargement, bloody congestion, serous or sero-purulent infiltration, purulent destruction, or general softening, is a very common state of one or both ovaries. In this city it is one of the most common lesions in cases of the disease terminating fatally. In the 222 cases collected by M. Tonnellé, it appears to have taken place at least in 62 cases, or more than one-fourth, and if we can trust another part of the report, it took place in 99 cases, or not much fewer than $\frac{2}{5}$ ($\frac{9}{25}$).

This lesion of the ovaries is very often associated with utero-venous inflammation. In the cases of uterine *phlebitis* recorded by Dr Lee, amounting to 24, in 11 were the ovaries either injected and enlarged or softened, and infiltrated with purulent matter. Sometimes they are enclosed within a thick coating of purulent lymph.

There is good reason to believe even, that, in cases which do not proceed to the fatal termination, the inflammatory congestion of the ovaries, though temporarily removed, lays the foundation of chronic incurable ovarian disease.

The last lesion I shall notice is inflammation and suppuration of the Fallopian tubes (*Salpyngitis*.) This is also a consequence frequently observed in cases of fatal puerperal fever. The whole course of the tube then is in general found lined with thick semifluid purulent matter. Purulent matter was found within the Fallopian tubes in three of the cases recorded by Dr Lee, and in one the interior of the tubes was reddened, swelled, and pulpy. Of the only two cases which terminated fatally under my own care in the Infirmary of this city, in one both Fallopian tubes contained thick purulent matter. In the statement given by M. Tonnellé no distinction is made as to suppuration of the Fallopian tubes.

The results obtained by M. Tonnellé may be given in the following manner.

Among 222 inspections of the bodies of females cut off with symptoms of puerperal fever,

Marks of peritoneal inflammation were observed in 193 cases.
Changes in the womb and its appendages in 197

Difference in favour of affections of the womb,

4

Marks of inflammation of the *peritoneum* and changes in the womb or its appendages, were found variously associated in - - - - - 165 cases

They were found separated in - - - - - 57

Viz. traces of inflammation of the *peritoneum* without effusion of the womb in - - - - - 28

And various changes in the womb without affection of the *peritoneum* in - - - - - 29

The changes in the womb were of two orders; 1st, changes in the substance of the womb or ovaries; 2d, changes in the veins.

The first class is distinguished in the following manner.

Simple inflammation (*metritis*) in - - - - - 79

Superficial softening in - - - - - 29

Deep-seated softening in - - - - - 20

Inflammation of the ovaries (*oaritis*) in - - - - - 58

Inflammation with abscess in - - - - - 4

—190

The changes in the vessels were distributed in the following numbers.

Purulent matter in the veins was found in - - - - - 90

In the lymphatics in - - - - - 32

In the thoracic duct in - - - - - 3

Along with inflammation and suppuration in the lumbar, inguinal, and other glands, - - - - - 9

—134

Making a total amount of changes in the womb of 324

These alterations, taken separately, exceed greatly in number those observed in the *peritoneum*. The excess of their number above that of the bodies inspected (222) arises from the circumstance, that several of these changes were observed in the body of the same individual.

The comparative frequency of the different morbid changes in the womb and its appendages may be estimated from the following numbers.

1. *Suppuration within the veins (Phlebitis.)*

Suppuration within the veins was accompanied with suppuration of the womb in - - - - - 32 cases.

With softening or putrescence in - - - - - 11

With inflammation (*metritis*) and softening combined in - - - - - 5

With <i>peritonitis</i> , independently of any other change, in 34	
Isolated or without other lesion in	8
	—90

2. *Suppuration within the Lymphatics.*

Suppuration within the lymphatics was associated with	
that within the veins in	20 cases.
With that of the womb in	13
With softening without suppuration of the womb in	6
With simple <i>peritonitis</i> in	3
Without other lesion in	2
	—44

3. *Inflammation of the Ovaries was distributed in the following manner :—*

Associated with simple <i>peritonitis</i> in	29 cases.
various changes in the womb in	27
simple inflammation (<i>metritis</i>),	8
softening	7
suppuration within the vessels in	12
all the previous alterations united	16
	—99

From these facts M. Tonnellé infers, 1st, that the changes in the womb, taken collectively, are a little more numerous than those in the *peritoneum*, and that they exceed them greatly if taken separately; 2d, that these two orders of changes are most frequently combined; and, 3d, that each may be absent when the other is present.

The cases recorded by Dr Lee in London lead to nearly the same conclusions. Among 45 cases of females destroyed under symptoms of puerperal fever inspected, Dr Lee found marks of inflammation of the peritoneum and of the uterine appendages in 32, softening of the womb in 10 cases, and traces of inflammation of the uterine veins in 24 cases. In one only of the latter class was the peritoneum free from marks of inflammation. In two cases (15th and 20th) the womb presented softening or putrescence of its substance. In 11 cases, one or both ovaries, and one or both Fallopian tubes, presented either marks of inflammation, as redness, tumefaction, and softening, or some of the effects of that process, as purulent matter within the tubes, abscess of the ovaries, or disorganization of these bodies more or less complete.

Lastly, Madame Boivin and M. Dugès inform us, that, in

the course of two years, they numbered at the Maternité, in Paris, 26 cases of essential, that is, idiopathic *metritis*, or uterine inflammation, and 686 cases of *peritonitis* or *metro-peritonitis*.

From all these facts various conclusions may be deduced, illustrating the parts and tissues most frequently affected in childbed fever.

1. The first inference, which is clearly established by all the facts, is, that the womb itself seems to be the part first, earliest, and most generally affected,—at least in all the cases which proceed to the fatal termination. Thus it appears that, among the cases inspected by M. Tonnellé, amounting to 222, in 197 there were lesions in the womb and its appendages, and in 190 of these the alterations were in the substance of the organ. It is true that among the total number of 222, in 193 marks of peritoneal inflammation were observed, and the difference, viz. 4, is so small as not to make the predominance of the simple uterine over the simple peritoneal disorders very great. A predominance, however, it is; and as such deserves notice in the careful estimate of the origin, course, and tendency of the disorder.

2. The second inference which results from the facts now stated is, that though the part first affected is the womb, the disease, in a very large proportion of cases, is a joint affection of the womb and the *peritoneum*; in other words, it is not a *Metritis* or *Peritonitis*, but a *Metro-peritonitis*. In this circumstance it may be remarked, that the disorder is first and most considerably seated in the uterine, or ovarian, or tubal peritoneum; and it seems most consistent with all the facts disclosed by morbid anatomy, to infer, that it begins at the same time in the womb and its investing *peritoneum*, in one ovary and its investing *peritoneum* (*Oaritis*, *Oophoritis*), or in one Fallopian tube and its *peritoneum* (*Salpyngia*). This inference is strongly confirmed by the close approximation made by the number in which the *peritoneum* was inflamed, (193,) to that in which the womb and its appendages was affected, (197,) viz. seven-eighths, and also by the great number (165,) in which lesions of the womb and of the *peritoneum* were combined.

3. Though the disease be often *Metro-peritonitis* or even ovarian inflammation (*Oaritis*, *Oophoritis*), and tubal inflammation (*Salpyngia*), yet, in a considerable proportion of cases, it may consist in these affections with inflammation of the veins

and lymphatics (*phlebitis uterina*). This has been denominated a complication; but the term is erroneously applied, and conveys an incorrect idea of the relation of venous inflammation to utero-peritoneal inflammation, and the symptoms thence resulting. The large proportion of cases, varying from two to three-fifths, in which the veins and lymphatics were affected, and the fact established by M. Dance, as to many cases, that the disease commences in that part of the womb, where the venous tubes may have been exposed by detachment of the after-birth, shows that this circumstance cannot be viewed as accessory, but is very often essential, and, in short, the incipient phenomenon in the train of morbid events. These veins, it is manifest, are in many cases, in the same situation in which wounded, or injured, or inflamed veins are in other parts of the body. A surface of the womb is denuded too suddenly for the contraction of the organ and the formation of clots;—or clots, though formed, are prematurely detached. Air may be admitted to the surface, or it may be generated by the decomposition of the natural bloody discharges (*lochia*), and irritate the orifices of the uterine veins, so as to cause their inflammation. Or the uterine surface itself may be inflamed, and the morbid action extends to the veins. Even the necessary manipulations required, in certain cases, for the removal of the after-birth, and the suppression of hemorrhage, may be the cause of venous inflammation. I shall afterwards show, when treating of venous inflammation, that a common cause of that accident after blood-letting, is the mere application of the finger of the operator to the open wound in the vein, which is, in certain circumstances, followed by inflammation. Much more likely is this result to ensue in cases where the hand is carried into the womb, either to detach the placenta, or to excite uterine contraction and suppress hemorrhage. From all these considerations, it is easy to see that inflammation of the venous tubes of the womb is likely to be a very common occurrence.

4. In not a few instances the disease begins at first with inflammation of one or both Fallopian tubes, (*Salpyngitis*, *Salpyngia*), especially of their interior, which proceeds very rapidly to suppuration. There is strong reason to believe, that this inflammation is the direct cause of the peritoneal inflammation. Inflammation of the Fallopian tubes cannot, in all cases, be shown to be connected with inflammation of the interior of the

womb. But if the admission of air to the interior of that organ, or the generation of air within it by decomposition of blood, can irritate the surface and induce inflammation, it is easy to see that the same cause is adequate to induce inflammation of the inside of the Fallopian tube, (*Salpyngia*). And further, if inflammation take place along the interior of the Fallopian tube, it may easily extend through it, and arrive at the open peritoneal end, and thence affect the *peritoneum*.

5. The inner surface of the womb itself may be attacked with inflammation, which may proceed either to exudation of lymph, to suppuration, or to softening. In the former case matter may be absorbed by the veins, and conveyed by these canals into the circulation; or the substance of the womb, generally with the inner surface, may be attacked with inflammation, which extends to the veins, or may terminate either in diffuse gangrenous softening, or circumscribed abscess.

6. Inflammation of the ovaries may take place, and proceed to softening, with serous, bloody, or sero-purulent infiltration, or complete purulent destruction of the ovaries. It is not quite certain, however, whether this is a primary phenomenon, or the result of inflammation of the uterine veins, or the transport of purulent matter from the womb to the ovaries.

7. It must not be forgotten that the anatomico-pathological history now delivered represents the lesions in the fatal cases only, and that it shows various effects which result from the simultaneous or successive affection of different tissues and organs. An important question here is suggested, viz. how few or how many of these lesions take place in the cases which terminate favourably, and to what extent and degree may they proceed without terminating fatally, when they do take place? These questions it is extremely difficult, in the present state of our knowledge, to answer. I shall attempt, however, to approximate, as near as the circumstances admit, to a resolution of them.

ANATOMICO-PATHOLOGICAL PROGNOSIS.—It may be regarded as well ascertained, that by far the most unmanageable form of puerperal fever is that, in which the womb is affected with gangrenous inflammation. It seems doubtful if, when this lesion is once established, any recovery is ever effected. It may be considered as not less certain, that the next most unmanageable form of the disorder is uterine venous inflammation, and the presence of purulent matter within the uterine

and collateral veins. It appears to be merely possible that, when the disorder is limited, especially to the pelvic veins, recovery may be effected; but, as it is doubtful whether, in these cases, the veins were inflamed, or their interior merely obstructed by bloody and fibrinous clots, satisfactory evidence to prove the sanability of the distemper is wanting. Suppurative inflammation of veins appears to be always and necessarily a fatal disease. Fibrinous inflammation appears occasionally to terminate favourably. I must mention, nevertheless, that Mr Travers, a most competent judge, entertains the reverse opinion, and thinks that it is the most rapidly and certainly fatal of the two forms of venous inflammation.

The reason of this fatality of venous inflammation is not very well known. Hunter believed it might arise from the inflammation being propagated to the heart; and this Abernethy and Cooper deemed certain, and established as a pathological principle. Mr Travers imputes the fatal result to the extensive distribution of the inflammation, and its consequent intense and general effect on the system at large. Others, again, as Bouillaud, regard the fatal event as the result of purulent matter in the blood, causing typhoid symptoms.* Mr Arnott has rendered it probable that the fatal event is principally to be ascribed to the occurrence of secondary inflammation, in various remote organs, but especially in those of respiration.†

We now perceive the explanation of an important fact in the morbid anatomy and mortality of puerperal fever, which has been remarked by all observers, but which has too often given rise to many vague and erroneous conjectures. It was long ago observed by Dr John Clarke, (Essay v. section vi. p. 137,) by Hull, by Boer, and indeed all who have carefully examined the bodies of females destroyed by puerperal fever, that purulent fluid was found not only in the *peritoneum* but within the *pleura*, sometimes within the pericardium, and that often the lungs bore traces of inflammatory destruction.‡ It would be idle to doubt that these collections are dependent either on the previous occurrence of utero-venous inflammation, or at least the introduction of purulent matter into the venous system of the womb.

* Recherches Cliniques pour servir à l'Histoire de la Phlébite, Revue Med. Juin 1825, p. 424, v.

† Medico-Chirurgical Transactions, Vol. xv. p. 45—53, &c.

‡ Plerumque noxa ad pulmones ruit, forma quasi, *Febris Puerperarum Lentæ*, phthiseos sistens speciem. Boer, iv. I.

Ovarian inflammation is not necessarily fatal if it be prevented from proceeding to suppuration. But when this has taken place, whether it be, that with it venous inflammation is usually conjoined, it seems very generally to be a fatal circumstance. I think I have repeatedly treated with favourable issue cases in which the ovaries were merely inflamed. To inflammation of the Fallopian tube the same remark is applicable.

Peritoneal inflammation is of itself not necessarily fatal, and it is perhaps chiefly this inflammation that takes place in cases which recover under the use of remedies.

SEMIOGRAPHY.—No task in the whole range of practical medicine is so difficult as to give a clear and correct delineation of the symptoms of puerperal fever; and the difficulty must be obvious to every one who studies attentively the anatomical lesions taking place in the disease. The facts disclosed by morbid anatomy show that all the original descriptions of this disorder, however elaborate, from Strother and Denman down to those previous to Dr Lee and M. Tonnellé, are more or less inaccurate, in so far as they confound together the symptoms belonging to lesions of different parts and tissues. Much confusion, disorder, and discordance, indeed, have prevailed among practical writers on the number and nature of the distinctions which they admit of the several forms and varieties of puerperal fever. Nor, in the recent descriptions by different obstetrical authors, does it appear to have been practicable to avoid ambiguity in distinguishing the symptoms into different forms. Most authors agree that there are varieties in the disorder; but on the number and characters of these great discordance prevails.

The great difficulty consists in the circumstance that, though very generally the disease begins with inflammatory symptoms more or less distinctly marked, yet in almost all cases these are quickly succeeded, and, as it were, masked or disguised by symptoms, in which extreme feebleness, languor, listlessness, and mortal oppression occupy a prominent part, and consequently present that general character to which many physicians have applied the names of putrid, typhoid, ataxic, and adynamic.

We have seen that John Clarke considered it as an epidemic low fever of specific characters, yet was obliged to admit that it is attended with inflammation of various abdominal and pelvic organs. Peu, Tissot, White, and recently Alphonse-

Leroy looked on it as a putrid, typhoid, or adynamic fever ; Antony Petit and Selle thought it a nervous fever ; Douleat ascribed it to gastric disorder ; and lastly, Walter, Johnston, Forster, and Cruickshank, Baillie, Hull, and Hey deemed it a local inflammation of the peritoneum.

The systematic writers have not diminished this discordance, and, by the multiplicity of division and refinement in distinction, they have rather obscured than elucidated the subject. Boer, the most accurate observer of the nature, characters, and tendency of this disorder, distinguished it in 1806 into four forms ; the first, the *benign puerperal fever not inflammatory* ; the second, *inflammatory puerperal fever* ; the third, *anomalous puerperal fever* ; and the fourth, the *malignant puerperal fever not inflammatory*. M. Vigarous distinguishes five species of puerperal fever ; 1st, the *gastro-bilious*, marked by intense hypogastric pain ; 2d, the *putrid bilious*, distinguished by great debility, small intermitting pulse, hypogastric swelling, with frequent pain and putrid symptoms ; 3d, the *pituitous*, or mucous ; 4th, the *phlogistic* or *uterine inflammation*, denoted by sense of great weight in the *pelvis*, hypogastric swelling, pain and hardness, with acute fever ; and 5th, *sporadic puerperal fever*, proceeding from mental emotion, distress, &c. Gardien recognizes six varieties of the disorder ; 1st, the *angiotenic* or *inflammatory* ; 2d, the *adeno-meningeal* or *mucous* ; 3d, the *gastric* or *bilious* ; 4th, the *adynamic* or *putrid* ; 5th, the *ataxic* or *nervous* ; and 6th, that complicated with affection of other organs. These varieties M. Martin of the *Hôpital de la Charité* at Lyons augments to seven, in the following manner ; 1st, the *gastric*, the most frequent, often complicated with worms, with epigastric pain, headach and full pulse ; 2d, the *intestinal*, also complicated with worms,—with *meteorismus*, *borborygmi*, and *diarrhœa* ; 3d, the epidemic puerperal, assuming the character of the prevailing epidemic constitution ; 4th, puerperal fever from retention of the *placenta*, first inflammatory, then adynamic or typhoid, with hard painful hypogastrium, small pulse and faintness ; 5th, *adynamic* or *putrid puerperal fever*, succeeding the gastric variety ; 6th, *puerperal uterine inflammation*, marked by fixed pain in the region of the womb, suppression of the *lochia*, hard pulse, redness of the margins of the tongue, dry skin, and porraceous vomiting ; and 7th, and lastly, puerperal fever consequent on

mental emotions, profuse hemorrhages, copious external suppurations, or purulent deposits in the substance of organs, always terminating in ataxic or nervous symptoms.

Still more recently, Dr Samuel Cusack distinguished the disease into three forms; 1st, the genuine inflammatory, marked by acute abdominal pain and tenderness, quick hard pulse, and other symptoms of *synocha*; 2d, the low or typhoid, generally epidemic, and allied to *erysipelas* and typhous fever, and similar low disorders, without tenderness, but with dull weight in the hypogastrium, weak languid pulse, and a sense of great faintness; and 3d, a mixed form, partaking of the characters of both,—with abdominal tenderness, yet with the pulse neither so hard and incompressible as in the first, nor so weak as in the second variety. M. Tonnellé refers all the varieties of the distemper which he observed under M. Desormeaux to three principal forms;—an inflammatory form, a typhoid, and an anomalous or ataxic form,—which he thinks correspond to the different lesions of the solids, of the fluids, and of innervation. The inflammatory form he further subdivides into two varieties; one in which the inflammatory symptoms were open, distinct, and permanent, the other in which they were transitory, and were speedily followed by typhoid symptoms. The second variety and the typhoid form were by far the most prevalent; and were generally if not invariably associated with softening of the womb, and purulent matter within the veins and lymphatics, whether that were the effect of venous inflammation, or received within their interior by absorption. This division has been modified by Madame Boivin and M. Dugès, who admit only two forms, one, the simple inflammatory or *metro-peritonitis angiotenica*, with strong, full, hard pulse; the other, the typhoid, in which, though the symptoms are at first inflammatory, a secondary adynamic state speedily ensues, with small, contracted, oppressed pulse, burning heat, intense thirst, and great oppression of all the vital and animal motions; and they refer to the latter both the typhoid and the ataxic form of MM. Desormeaux and Tonnellé. Lastly, Dr Lee, discarding the name and nosological characters of puerperal fever, and puerperal peritonitis, as hitherto maintained by authors, considers the several febrile disorders ensuing on parturition as essentially dependent on inflammation of the womb and its appendages, and the differ-

ent forms which they assume, as referable to the circumstance of affection of the serous, muscular, or venous tissue of the organ. Little doubt can be entertained, that, so far as our knowledge of the relations between the external symptoms, and the affection of the internal organs goes, this view is the most rational. If it be still imperfect, that is rather to be attributed to the circumstance, that in very few cases, perhaps, is one tissue exclusively affected, and consequently it is difficult, if not impracticable, to connect in any given case the external signs with any single lesion. The symptoms of mere peritoneal inflammation are modified, or, it may be, obscured, by those arising from ovarian or tubal inflammation, inflammation of the substance or inner surface of the womb, or the symptoms of uterine venous inflammation. This circumstance shows at once that the terms of typhoid or adynamic or ataxic puerperal fever, whether applied to forms or stages of puerperal fever, must convey a most erroneous notion of the pathological nature of the disease, and are in every respect inadmissible. Puerperal and typhous fever agree in no circumstance unless in their concluding stages, namely, the production of the fatal event.

Another consideration is, that in no disease is the character of the symptoms so much modified by the method of treatment, as in puerperal fever. If the disease be allowed to proceed from its commencement to its termination, uncontrolled by remedies, then the inflammatory symptoms of the incipient stage are more or less speedily succeeded by those of languor, feebleness, and oppression, which morbid anatomy shows depend on the effusion of purulent fluid, suppuration of the ovaries and Fallopian tubes, purulent matter within the veins, and softening of the womb. But if active measures be promptly adopted in the early stage to subdue the inflammatory action, then the disease is simple and uncomplicated, is followed only by symptoms of simple debility, without that arising from disorganization of important organs; and from that the patient slowly but steadily recovers.

From all these considerations, I am disposed to distinguish the symptoms of puerperal fever in the following manner. 1. Those of uterine *Peritonitis* or *Metro-peritonitis*; 2. Those of uterine venous inflammation (*phlebitis uterina*), generally with *metro-peritonitis*, *Oaritis*, *Oophoritis* or *Salpyngitis*; and 3. Those

of uterine gangrenous inflammation, with or without uterine phlebitis.

1. *Metro-Peritonitis*.—This disorder, though occasionally commencing before delivery and during the last stage of pregnancy, usually makes its appearance in the course of from twenty to thirty hours after parturition. Its first approach is indicated either by a fit of well-marked and rather violent shivering, (*rigor, horripilatio*;) or by the occurrence of wandering sensations of cold recurring at intervals, and sometimes so slight as to escape notice. Soon after the belly becomes more or less painful, especially in the umbilical, hypomphalic, and pubal region; and the pain is aggravated by pressure, coughing, or deep inspiration. The abdomen is more or less swelled, and sometimes, not uniformly, tense; and the sound which is emitted is generally unusually clear or tympanitic, at least in the early stage of the disorder. In the incipient stage the belly may be flaccid or lax, in consequence of the previous distension and the distending cause having been removed; but to this flabbiness it is imprudent to trust. At the same time, when the belly and chest are attentively observed, it is found that the alternate motions of inspiration and expiration are performed principally, sometimes entirely, by the ribs and intercostal muscles, the elevations and depressions of which are distinct and extensive, while the elevation and depression of the abdominal muscles, corresponding to the descent and ascent of the diaphragm, are much less extensive than usual, and not unfrequently nearly obliterated. These motions are also more frequent in a given time than natural, being seldom fewer than 36 in the minute, and more frequently being so numerous as 44, 48, and 56 in the minute. At the same time, the patient lies supine on the back, with the thighs and knees drawn up towards the belly.

It happens, in a certain number of cases, that the pain, though felt generally over the whole hypomphalic region, is more particularly intense in one spot; and sometimes, when it is not complained of generally, it is found, on careful examination and palpation, to be fixed in one particular point. The part in which I have observed this greater degree of tenderness is often one or both iliac regions, right over one or both ovaries, or one or both Fallopian tubes. In other instances it is referred very exactly to the fundus, or to one angle or one side of the womb.

The pulse is always very rapid, most usually above 100, sometimes so quick as 130 or 140 in the minute. At first onset it is tense and throbbing, sometimes full, but occasionally wiry and contracted ;—afterwards it is small and oppressed, but equally frequent.

The face at the commencement is more or less flushed ; and the countenance is anxious and expressive of suffering. As the disease advances the face is less flushed, and acquires a brownish tint ; a flush, sometimes circumscribed, is observed on one or both cheeks ; the features shrink ; and the eyes become sunk, while a general expression of listlessness is diffused over the whole countenance.

The state of the tongue varies. At the beginning it is generally covered with a rough viscid fur, which, though at first moist, speedily becomes dry, and may be either rough, or smooth and glassy. In the advanced stage of the disease the viscid, gray, or leaden-coloured fur becomes brownish ; and a dark-coloured viscid mucous secretion is collected on the prolabium, gums and teeth. In some cases, especially in which diarrhœa takes place, and while the pulse continues rapid, the tongue is of a red fiery colour, with a very dry and smooth glassy surface.

The state of the alimentary canal and its functions is also variable. In some instances vomiting takes place at intervals, and every article is rejected. In others it is less frequent ; and in some it is not observed till the very close of the disease. In such cases as those now specified, it may generally be inferred, that the inflammatory action does not affect the *peritoneum* of the alimentary canal generally, or at least that the membrane of the *ileum* escapes. In general, at the commencement of the disease, the bowels are constipated, and resist all means employed to relax them ; and when they are made to act, the discharges are thin, serous, dark-coloured, and void of the usual feculent odour. Towards the close of the disease, however, a change of two different kinds in this symptom takes place. When the disease is terminating favourably, considerable quantities of excrementitious matter, generally dark-coloured, sometimes containing consistent masses, and always presenting the feculent odour, are expelled, while the belly diminishes in size, and becomes less tympanitic, the breathing becomes slower and fuller, the tongue becomes more moist, the countenance less

flushed and anxious, and the eye becomes clear and animated. When, on the other hand, the disease is terminating unfavourably, either the bowels continue bound, or diarrhœa comes on, in which considerable quantities of thin serous matters are discharged, without the belly diminishing in size, and with continuance of the tympanitic state, and quick, short, panting breathing, while the tongue continues dry, smooth, and glassy, or is covered with a brown, foul, viscid fur, and the countenance is anxious, the face pale and dingy, but the cheeks flushed, the features collapsed, and the eyes hollow.

The state of the *lochia*, to which great importance has been attached, is also liable to variation. They have been very generally represented to be always suppressed; and certainly in many cases they suddenly cease to flow. But in other cases, not few in number, the quantity of bloody discharge is merely diminished. In some instances also they emit an offensive odour; but this odour may be in certain females, especially if red-haired, emitted by the uterine excretion, even without any uterine disease. It is impossible therefore to rely either on the diminished quantity, or on the fetid odour of the lochial excretion, as diagnostic marks. The *vagina*, *labia*, and *os uteri*, are often swelled and painful; and the adjoining cellular tissue is liable to serous infiltration.

The breasts are generally loose and flabby, and the secretion of milk either does not ensue, or, if commenced, stops. In some cases, however, milk is secreted until a short time before death.

The urine is always scanty and high-coloured, and is often, on being voided, attended with heat and scalding, especially if the *vagina* and *labia* be affected. As the inflammatory symptoms abate, or are subdued, the urine becomes more copious, and generally deposits on cooling a brick-coloured sediment.

The skin is at first hot and dry; and this state continues, if the symptoms be not moderated by adequate and prompt depletion. If the intensity of the disease abates, the skin becomes more cool, and at length is generally moistened, gradually and gently. If the disease proceeds, the skin continues dry and harsh, without being quite so hot as at first; afterwards it is alternately moistened with partial and sometimes profuse sweats, and parched with burning heat. Almost invariably this state is connected with the effusion of albuminous

and purulent or sero-purulent fluid; sometimes with suppuration in the ovaries or Fallopian tubes.

The duration of this disease is various. It may terminate fatally in the course of three days, or even sometimes in a shorter space; but it may be protracted to five, six, or seven. I have seen it protracted to five or six weeks, and terminate fatally at the end of that time.

The symptoms denoting fatal termination are, extreme rapidity and smallness of the pulse, great quickness, labour, and panting in the respiration, especially its continuing thoracic, swelling and tympanitic distension of the belly, whether painful or not, vomiting, retention of the urine, or pain and difficulty in voiding it, listlessness, indifference to external objects or the infant, with slight stupor or somnolence, and an oppressed languid aspect of the countenance.

2. *Uterine Venous Inflammation. (Phlebitis uterina.)*—The commencement of uterine venous inflammation may often be traced to the first days after delivery. But as it is very generally associated with *metro-peritonitis*, or ensues upon its symptoms, it is difficult to fix exactly the date of its commencement. The chief circumstances to be attended to are the following. Though the attack commences much like an attack of puerperal peritonitis, with shivering, succeeded by heat, pain in the hypomphalic and pubal region, rapid, panting, thoracic respiration, quick tense pulse, and other symptoms already enumerated, these are speedily accompanied with, and obscured by, the symptoms indicative of venous inflammation. There is generally a sense of pain and weight deep in the pelvis; and the womb may be felt large, swelled, and painful. But as even the latter state of the organ may take place without inflammation of the venous canals, the symptom must not be regarded as diagnostic. The pulse continues quick, but becomes small and feeble; the breathing, which is thoracic, is also quick, short, laborious, and panting; the face assumes a reddish-brown or dingy tint; the countenance becomes languid, haggard, and listless, and with a dull heavy aspect of the eye. The *prolabia*, teeth, and gums are covered with a dark, viscid, mucous coating; and the tongue, which was at first rough and dry, becomes black and brown. The patient is also oppressed with a peculiar somnolence or drowsiness, yet is restless and sleeps not, but speaks incoherently, mutters, or is very furious. The respiration becomes still more rapid, short, limited, and laborious,

and is also irregular, being for some space slow and languid, and then short, panting, and frequent. The surface of the whole body acquires a dingy or faint-yellow tint; and in some instances it is said petechial spots, or miliary vesicles appear. But I believe that these, especially the latter, are more frequently associated with gangrenous inflammation or softening of the womb. At all events, they seem not to be necessary to uterine venous inflammation. Lastly, flushing of the face, with partial sweats, and occasionally alternating with shiverings, low delirium, and insensibility (*typhomania*,) with *subsultus tendinum*, appear, when purulent matter is already formed within the veins; and death speedily ensues.

The same order of symptoms is observed in cases in which the ovaries are infiltrated with sero-purulent or purulent matter, or contain abscesses, and in which the Fallopian tubes contain purulent matter.

3. *Softening or Mollescence. (Metritis Mollescens; Metritis Septica.)*—The symptoms attending puerperal fever with mollescence of the womb are so much the more difficult to be accurately described, that the change has been confounded with puerperal fever in general, or puerperal fever with miliary eruption, and that the disorder is often at first latent, and makes some progress without characteristic symptoms.

In some instances it takes place during the latter stage of pregnancy, previous to parturition; and then labour is slow and languid; the uterine contractions are few, feeble, and irregular; the *liquor amnii* is turbid and fetid, sometimes of a dark-brown colour; the infant is either dead, with all the appearances of atrophy, or comes into the world wasted and shrivelled, and speedily dies; the after-birth is flabby, softened, and partially or generally in a state of decomposition; hemorrhages from the womb take place; the organ itself is incapable of healthy vigorous contraction; and not unfrequently it is ruptured before the process of parturition is completed. It is indeed an important fact, that laceration of the womb is in a considerable proportion of cases, if not always, the effect of previous softening and attenuation of the uterine tissue, or that alteration which I have mentioned as constituting Atrophy of the womb. Several examples illustrating the truth of this doctrine are recorded by authors. (Jacquerez, Henne.) Death is in general then speedy, sudden, and unexpected.

In other cases, whether it has made some progress previ-

ous to parturition, yet without well-marked symptoms, or ensues only after that process is completed, it is equally insidious, and immediately and suddenly destructive in its effects. Thus Boer states, that he saw pregnant and recently delivered women suddenly expire in convulsions; and on inspection he recognized unexpectedly, and without the occurrence of any previous symptom to indicate its presence, gangrenous softening of the womb. (Lib. iii. *De Putrescentia Uteri*, cap. i.) Others, after parturition was completed and the foetus easily expelled, were speedily, without manifest cause, attacked with unusual fever and exhaustion, and died within the course of two days; and equally unexpectedly softening of the womb was discovered after death. In other cases the symptoms were merely those of obstinate puerperal fever, which resisted all medical treatment. Lastly, in another class of cases, the external symptoms, under which the patients perished, were those of miliary fever and eruption.

Boer himself admits the extreme difficulty of specifying the symptoms of this disorder; and though he thinks he can recognize its presence, and predict the fate of the patient, yet so variable and equivocal are the symptoms, and so trifling do they on cursory examination appear to be, that it is almost impossible to describe them in such a manner, as to enable another readily to recognize the existence of the malady.

It is, in the first place, to be observed, that all the affections peculiar to malignant fevers, even when complicated with inflammation, very often attend this disorder. Yet several of them may be absent; and Boer witnessed females die of this disease with the belly soft and void of pain, the pulse almost natural, the tongue not foul, and the head clear.

The disease, however, is occasionally observed to be attended with febrile symptoms, especially chills alternating with heat, and pain in the pubal and vaginal regions.

The fever is in such circumstances represented to belong to the tribe of continuous-remittent, yet rarely to present distinct exacerbations or new accessions with evident cold fit. The patients become hot and flushed chiefly towards evening, and speedily sweat profusely, yet without alleviation of the symptoms, and with much diminution of strength, while the urine is clear. The tongue is said to be generally moist and clean, while the thirst is burning and perpetual. If, however, the tongue be attentively examined, it will be found not to be

moist, but glossy, red, and smooth, and a peculiar transparent mucous filmy covering is spread over its surface. When the approach of the paroxysms is attended with violent shivering, death is near. Few survive the third paroxysm.

In most patients vomiting of green mucous matters, with a sediment not unlike the lees of oil, takes place; and the more copious and easy the vomiting is, the disease is more intense and dangerous. Most patients also are distressed with exhausting diarrhoea, in which the discharges are of a brown-yellow colour, of a very offensive smell, and interspersed with white tough flocks. Worms were in some of the Vienna cases discharged by the mouth; and the symptoms were hopeless. In two cases the bowels remained obstinately bound, notwithstanding the use of many laxative medicines and *enemata*; and in these death took place on the third day.

The secretion of milk is much deranged. In some cases the breasts swell; but the fluid disappears either gradually or rapidly. Boer saw the breasts in the last gasp containing milk; nay after death even the quantity seemed increased.

In the state of the *lochia* there is great variety, attributable apparently to the extent of the womb affected. They are generally scanty; yet they do not cease to flow altogether; nor are they so much deranged as might in so destructive a disease be presumed. Sometimes they are replaced by a dark serous discharge, thin, acrid and scalding.

Though cases of gangrenous softening of the womb take place, in which the patient makes no complaint of pain or uneasiness in the region, yet in others the belly is painful in the pubal region, deep in the pelvis, in the inguinal regions, or at the *os uteri*. When the patient complains not, even on examination *per vaginam*, it may be inferred that the natural sensibility is so much impaired, and the connection between the *sensorium* and remote organs so much interrupted, that the disease has made great progress, and committed irreparable ravages. There is in this circumstance, indeed, nothing more extraordinary than what is observed in the advanced and concluding stage of many disorganizing processes, in which the natural connection between the *sensorium* and the different organs is impaired or totally interrupted.

When the womb gives no indication of pain, Boer observes that it is more enlarged than natural in different degrees, and

generally soft and flabby, and like the tip of the muzzle of a dog; and that when it is the seat of pain, it is thicker and harder than natural.

In general, patients attacked with gangrenous softening of the womb speak little and slowly, and evince a degree of listless indifference to all objects, and especially to the infant. The muscular strength, indeed, is so much impaired, that they usually lie in an inert, motionless condition, totally incapable of any corporeal effort. As the disease advances, the breathing becomes rapid, short, and constrained; the power of speech is entirely lost; the pulse becomes small and intermitting; the urine and alvine contents are discharged unconsciously; and stupor, with or without convulsions, terminates in death.

By far the most important circumstance, however, afforded by the history of this fatal distemper, is the fact, that miliary eruptions, either white or red, or both, may take place, and usually appear sometime before the close of life. It has been long known that the miliary is an eruption altogether symptomatic; that sometimes it is an eruption quite trivial and unimportant; and that in other instances, more especially when it takes place in puerperal females, it is fraught with the greatest danger, and is too often found to be a fatal symptom. The explanation of this discordance we now recognize in the fact observed by Boer, that the miliary eruption of puerperal fevers is very often only a symptom of gangrenous inflammation of the womb, either with or without uterine venous inflammation. (See Vol. i. p. 507.)

The foregoing history shows that it is difficult, if not impracticable, to fix the duration of this disorder. In most cases it is very short; and Boer saw it terminate fatally in a few hours even after natural parturition; but in such circumstances little doubt can be entertained that it had commenced before parturition, and made some progress. Most usually it terminates in death from the second to the fifth day after delivery. When its progress is less rapid, it may be prolonged to the twentieth day and even later. In one of the cases given by Boer, death took place on the evening of the nineteenth day. But the majority of patients expire before the eleventh day.

The terminations of softening of the womb may be understood from the account already given. Some, and among others, Luroth, have proposed the question, whether it is susceptible of

terminating by resolution; and to him this appears possible in the early but not in the advanced stage. To resolve judiciously questions of this kind, I would always suggest the aid of morbid anatomy and correct pathological knowledge, which shows by every fact, that, though morbid actions may and often are arrested and subdued by suitable remedies, their disorganizing effects never are removed. Softening of the womb is doubtless the effect of previous morbid action; and if the action be not arrested at the first, it may be safely asserted, that its effect cannot be prevented or removed, when it has taken place. Luroth is also of opinion, that softened portions of the womb may be detached and expelled by the suppurative process. This, however, I doubt; as the detachment of such portions must have implied a more sound state and healthy energetic action in the rest of the womb,—a circumstance not known to be observed in cases of genuine mollescence. These are in fact the mortified circumscribed sloughs already noticed as observed by Duplay, and Boivin and Dugès. When the disease or disorganization is thoroughly established, its natural termination is death. And this it produces either by the deep impression on the system, or by causing laceration of the womb.

Mollescence of the womb is a disease fortunately not very prevalent. From all the observations hitherto made, it is more frequent in large lying-in hospitals, than in private houses and infirmaries organized on a small scale. It is observed especially in those fatal epidemics of puerperal fever which so frequently prevail in the large establishments of the first class, and which are usually found amidst the crowded habitations and the impure air of large populous cities. The Lying-in Hospital of Vienna is the place where it was first observed, where it has afforded the most abundant means of studying its nature, and where it has most frequently recurred. Next to that it appears to have prevailed most in the Hospice de la Maternité at Paris. And lastly, it has been observed in London by Dr Lee. According to Boer, it is more frequent in autumn and winter than in other seasons, and its appearance is evidently favoured by a humid relaxing state of the atmosphere.

TERMINATIONS.—The terminations of puerperal fever may be understood from the facts already stated illustrating its pathological causes, its course, and the several tendencies of the morbid actions in the tissues affected.

I have already specified the conditions under which *metرو-peritonitis* may terminate in resolution, or may gradually subside without leaving morbid products seriously affecting the structure and functions of the womb, or the general and uterine *peritoneum*.

Though, when the disease attacks the ovaries and Fallopian tubes, it may also terminate in resolution, or what is rather absurdly and mysteriously named *delitescence*, it is much more liable to proceed to the effusion of lymph, serous or sero-purulent fluid, and purulent disorganization. Various singular consequences then ensue, providing the disease do not immediately prove fatal. Thus, in one instance, which occurred to Dr Lee, the ovary was converted into a large purulent cyst, which had by coagulable lymph formed adhesions with the abdominal *parietes*, and discharged its contents through an ulcerated opening. In another case, which terminated fatally, the inflamed ovary and Fallopian tubes, agglutinated by lymph, had formed adhesions with the peritoneum at the brim of the *pelvis*, the inflammation had spread to the subserous filamentous tissue, and purulent matter had been copiously deposited in the course of the *psoas* and *iliacus internus* muscles, as in lumbar abscess. In other two cases, in which recovery ultimately took place, purulent matter, which had been collected in the same situation from inflammation of the same parts, made itself an outlet at the upper part of the thigh, with the effect of producing temporary contraction of the thigh on the trunk, which, however, disappeared. But one of the most extraordinary terminations of cases of this kind occurred in a patient under my own care, in the Royal Infirmary of this place. A woman had been previously treated for fever supposed to be typhoid, until the symptoms had proceeded so far as to render the effect of active treatment questionable. Blood, however, was drawn from the arm, and afterwards, by means of the repeated application of leeches, from the right inguinal region, where pain was felt, and dulness was recognized. About the fourth week after she came under my care, a quantity of purulent matter was discharged from the rectum, with some transitory relief to the symptoms. Death, however, took place; and, on dissection, I found on the right side of the rectum, between that bowel and the uterus, an ulcerated opening from the cavity of the peritoneum, whence the matter had escaped. The right ovary was found covered with purulent lymph.

In some cases matter has been discharged by the navel, with the effect of ultimate recovery.

ETIOLOGY.—If we except the puerperal state, which undoubtedly favours the production of the disease, we are almost entirely ignorant of the circumstances under which it is most likely to take place. Denman remarks, that though it may follow a labour under the best circumstances, yet endeavours to dilate the *os internum*, too hasty separation of the placenta, and binding the belly tight after delivery, will often produce it; and more readily in easy than in hard labours, from which women generally recover more speedily than would be expected. There appears to be nothing very certain in the individual constitution disposing to the formation of puerperal fever. The strong and the weak, the plethoric and the spare, are equally the subjects of its attack, are liable to perish by its violence. It is remarked, however, by Dr John Clarke, as an instance of the power of moral causes in inducing it, that unmarried women who have become pregnant, though placed in similar circumstances with married women in all other respects, have been attacked in much greater proportion; and that females, whether married or unmarried, whom their circumstances oblige to take refuge in public hospitals, are much more liable to be attacked than those who are in circumstances to be attended at their own houses. In the first case, the circumstance of loss of character and desertion by friends, with all the mental distress which results; in the second, poverty, destitution, and widowhood, act as powerfully depressing passions, and too often render the system unable to withstand the attacks of morbid causes. At the same time it is also to be remembered, that persons in this rank of life generally dwell in the most confined and badly aired parts of large and populous towns, in which they are exposed to numerous causes of bad health. It is further not unlikely that errors in diet have considerable influence either predisposing to, or in producing, the disease. Most authors dwell on the bad effects of the hot stimulating regimen which is still too often pursued by the lower ranks even in the present day; and it cannot be doubted that this, in some instances, accounts for the greater prevalence of puerperal attacks among the lower and poorer orders of the community, than those whom their situation generally renders more liberal and enlightened.

An important feature, however, in the etiology of puerperal fever, is its occasional prevalence as an epidemic.

In the winter of 1746, a fever, similar to what we now call puerperal, prevailed with great violence among the lying-in women of the Hotel-Dieu of Paris. In the month of February, of 20 seized with it, hardly one escaped.

In 1750-1761-1764, it was very prevalent in the Hotel-Dieu of Lyons.

In 1760, about eleven years after the first institution of lying-in hospitals in England, it was epidemic in London; and 24 women died of it in the British Lying-in Hospital, between the 12th of June and end of December. (Leake, p. 234.) In the same year it was epidemic at Aberdeen. (Gordon, p. 5.)

In 1761, it was prevalent in London during the latter end of May, June, and the beginning of July. In a small private lying-in hospital, 20 patients died of it in the month of June. (White, p. 165.) In the same year it was epidemic at Aberdeen.

In 1767, puerperal fever appeared first in the Lying-in Hospital of Dublin, about ten years after it was opened for the reception of patients. From the 1st of December to the end of May, of 360 women delivered 16 died. (Joseph Clarke, Medical Comment. Vol. xv. p. 305.)

In 1770, it was violent in several of the London hospitals. In the Westminster, between 30th November 1769 and 15th May 1770, of 63 women delivered, 19 had the fever, and 14 died, which is nearly every fourth woman. (Leake, p. 234.) In the British Lying-in Hospital, of 890 delivered in the course of the same year (1770,) 35 died, or one in $25\frac{1}{2}$. (White, p. 337.)

In 1771, in an hospital not named by Mr White, but which, from the date of its institution, appears to be the British, in Brownlow Street, Long Acre, of 282 delivered, 10 died, or one in 28. (Ibid.)

In 1773, puerperal fever appeared in the Lying-in ward of the Royal Infirmary, Edinburgh, about the end of February, attacking almost every woman immediately, or, at most, within twenty-four hours after delivery. Six women died, after which the ward was shut up. (Joseph Clarke, Med. Com. Vol. xv. p. 303.)

In 1774, this fever appeared the second time in the Dublin Lying-in Hospital, and destroyed, among 280 women delivered during March, April, and May, 13 persons, or one in $21\frac{1}{2}$. (Ibid.)

During the same year, it committed still greater ravages among the lying-in women of the Hotel-Dieu, reappearing every winter till 1781, attacking in general seven out of 12, and killing all whom it attacked. (*Ibid.* p. 305.)

In 1787, it appeared in London, causing great mortality, especially in hospitals, and puerperal patients in general all over the country, (John Clarke, 110, 112,) and continuing more or less during 1788.

In 1787, it was also epidemic in Dublin, in the hospital of which, among 128 women delivered between the 17th March and the 17th April, 11 were seized with symptoms of puerperal fever, and seven died.

In November 1788, it appeared in the same hospital the fourth time since the institution. During this and the two succeeding months 355 women were delivered, of whom 17 were attacked, and 14 died. (Joseph Clarke, *Med. Com.* p. 306.)

In 1789, it appeared for the third time in Aberdeen, and destroyed four women during the month of December. Continuing during 1790, it attacked 34 women, of whom 15 died. During 1791, it affected 30 persons, of whom eight died; and in the course of 1792 it affected nine persons, of whom only one died.

In 1808, puerperal fever appeared at Barnsley, twenty miles south of Leeds, and was very fatal. In November 1809, it appeared in Leeds, and continued, with different degrees of severity, and with occasional intermissions, till the termination of 1812, spreading also to the country, and some of the neighbouring towns. (Hey, p. 16.)

In 1813, it was epidemic in the counties of Durham and Northumberland. It appeared first in 1811, in the neighbourhood of Stockton-upon-Tees, afterwards in Newcastle-upon-Tyne, in Sunderland, near Chester-le-Street, then in the vicinity of Newcastle-upon-Tyne; and, lastly, in and about Alnwick. (Armstrong, p. 13.)

At Sunderland, it first appeared in January 1813, in a sporadic form, and mild; afterwards, in the spring, it became more violent, and killed five persons in rapid succession; eventually 43 cases occurred between the 1st January and the 1st October, when it ceased.

In 1814 and 1815, it appeared in the Edinburgh Lying-in Hospital, and of nine persons attacked only one recovered.

In 1821-22, it appeared in the same institution, and was epidemic in the town and vicinity, continuing more or less throughout 1823.

This view of the history of puerperal fever shows, that its prevalence depends often on some cause or causes of general operation,—on the influence of circumstances which may affect at the same time a considerable number of individuals. What these circumstances are has long been a subject of inquiry among physicians; but it does not appear that their researches have hitherto led to any determinate result. Thus one party refer the epidemic prevalence of puerperal fever to atmospheric influence, or an unhealthy state of the air and weather; while others ascribe it to the noxious effects of a subtile matter or effluvium, communicated by infection or contagion from one person to another. Leake, for instance, talks of the epidemic of 1770 arising from no other cause than a malignant constitution or distemperature of the air; White asserts, that a true puerperal fever is originally occasioned by a putrid atmosphere, and takes repeated occasion to notice the frequency and fatality of the disease in populous towns and crowded hospitals; Kirkland adverts to the putrid miasms of lying-in-hospitals; Joseph Clarke attaches importance to the unfavourable weather of the spring of 1787, and the imperfect and slow recoveries of patients previous to the epidemic of that year; and John Clarke of London mentions the mild rainy winters of 1785-6-7, with the prevalence of erysipelatous inflammations, bad sore throats, low malignant fevers, which preceded the puerperal epidemic of London.

The idea of its infectious properties, on the other hand, has been supported by Professor Young of Edinburgh, Gordon of Aberdeen, and is partially admitted by Hey and Armstrong; while others, as Walsh and Willan, believe it to be, in such circumstances, complicated with contagious fever, or other infectious disorders. The first of these authors, in a dissertation read before the Philosophical Society of Edinburgh, endeavours to show, that puerperal fever, strictly so called, is in every instance the consequence of contagion; but he contends, that the contagious matter, whatever it be, is capable of producing its effect only in consequence of the predisposition communicated by delivery and its consequences. In support of this opinion, he adduces the example of the Lying-in-ward of the Royal Infirmary of Edinburgh, in which puerperal fever was for many years altogether unknown; but after it was once

accidentally introduced into the hospital, almost every woman was, in a short time after delivery, attacked by it; although previous to delivery she may have lain for weeks together, not only in the same ward, but even the next bed. As a further proof of its contagious property, he remarks, that it was eradicated from the hospital by emptying, ventilating, and newly painting the ward, after which processes, puerperal females remained as free from the disease as before. To demonstrate the infectious nature of the epidemic at Aberdeen, Gordon states, that women in the higher walks of life were not exempted, when they happened to be delivered by a midwife or physician who had previously attended any patient labouring under the disease; and he afterwards takes considerable pains to prove, that every person who had been with a patient in puerperal fever became charged with an atmosphere of infection, which was communicated to every pregnant woman who happened to come within its sphere; and even acknowledges, that he was himself the means of conveying the infection to a great number of women. He therefore infers, that puerperal fever depends on a specific contagion or infection altogether unconnected with a noxious constitution of the atmosphere, and differing entirely from the contagion of fever (*synochus* and *typhus*,) as was believed by Walsh. This idea, indeed, of the identity of the puerperal and typhous contagion, if the former be admitted to exist, was completely disproved by the experience of the febrile epidemic of 1817-1820; for while abundant proofs of its contagious nature were daily afforded in this city, puerperal fever was entirely unknown, and began to appear only after the former had ceased to exist as an epidemic.

Hey, on the contrary, admits, that, if the epidemic of Leeds was infectious, it was so in a very inferior degree to that of Aberdeen. He was aware of instances of free communication, by the intervention of others, between women in labour or child-bed, and those affected with the disease, without bad effects; and, on the contrary, in many cases of puerperal fever, no channel, by which the disease might be conveyed, could be traced. (P. 198.) At the same time, it must be remarked, that Mr Hey adopted in his own person all the precautions of change of apparel and diligent ablution, which the most scrupulous and apprehensive believer in infectious propagation would recommend. This, he acknowledges, he did, not from conviction of its necessity, but for the

satisfaction of his own mind, and the safety of his patients. Armstrong, when he first published on puerperal fever, was led to believe it invariably contagious, in consequence of its prevailing in general epidemically, of its being remarkably limited to the practice of certain individuals, and from the general analogies in the laws of febrile diseases. He afterwards acknowledged, however, that this inference was precipitate; and, though two practitioners in whose practice the disease appeared in 1813, in the north of England, were so assured of their conveying the contagion, that they retired for some time from professional duty, yet, as many of his correspondents who had no theory to support, saw reason to conclude that the disease in its ordinary sporadic form was not contagious, he thought it better to leave the matter undecided, till more positive evidence was obtained. In the Edinburgh epidemic described by Drs Campbell and Mackintosh, they saw no instance which could be ascribed to contagion. In these circumstances it is manifest that no certain conclusion on the contagious nature of puerperal fever can be drawn. The most obvious difficulty in the way of the contagious origin of such a disease is the mode of its first origin or commencement; for it cannot be said that the puerperal, like the febrile, variolous, scarlatinous, or rubeolous contagion, is always existing somewhere, and is ready, under favourable circumstances, to give rise to the disease. If this were the case, it is manifest that a much greater number of puerperal women would be affected by it, since in large towns it is impossible to suppose, amidst the great number of childbed women, some to whom this morbid principle, according to the hypothesis, would not be applied. If the disease be capable of forming its own contagious matter or atmosphere, still, as we must admit a first or generating case, it is as easy to suppose all of them to be of this description.

On the subject of the alleged connection of puerperal fever with erysipelatous inflammation, I must refer to the work of Dr Lee, and the Essay of Mr Ingleby in the 49th Volume of the Edinburgh Medical and Surgical Journal.

Denman remarked that there are not wanting instances in which it has been evidently forming before delivery or during labour; Joseph Clarke informs us, that he saw reason to date the commencement of several cases from before delivery, and refers to two cases in which the speed of termination of life after labour, and the appearances on dissection, evidently led to

this conclusion (44); and Hey refers to two cases in which evident symptoms appeared previous to delivery; one fatal. I had occasion to know, and to treat a very well-marked case of peritoneal inflammation during the last stage of pregnancy; and though very copious depletion was employed, with the effect of subduing all the symptoms, delivery went on well, and a healthy, though small, male child was produced.

I must further observe, that Amelung of Darmstadt, in his sketch of the puerperal fever of Vienna in 1820, and in that of the cases observed by him at Darmstadt, represents the disease to come on, or at least its elementary movements to be formed, during the latter end of pregnancy, especially among the inferior and indigent people, who have to contend with anxiety, cold, and imperfect clothing, and who often look forward to the period of delivery with solicitude and apprehension.

DIAGNOSIS.—Puerperal fever is to be distinguished from milk-fever, after-pains, inflammation of the womb, (*Hysteritis*; *Metritis*;) child-bed weed, (*Ephemera*;) and from ordinary continued fever, (*Synochus*; *Typhus*.)

TREATMENT.—The treatment of this disease has been the subject of much discussion. But if the pathology above delivered be founded on genuine facts and correct observation, all doubt as to the measures to be adopted will quickly vanish. Hulme and Leake, who first illustrated the disease by morbid anatomy, likewise inculcated the necessity of treating it as an inflammatory complaint; and Denman, who wrote before them, and whose method of cure was founded on empirical knowledge chiefly, lived to rectify his pathology by the same means, and to add his testimony to the propriety of the antiphlogistic method. (Introduction to the Practice of Midwifery, p. 448.) The justice of these views has been amply confirmed by the experience of Gordon, Hull, Hey, Armstrong, Lee and Dewees. It is indeed true that they have been opposed by both the Clarkes, by Walsh, by Hamilton of Edinburgh, by Brenan of Dublin, who recommends oil of turpentine, and by several others of less note. But if the effect of the remedies which these physicians have recommended, be regarded more than the remedies themselves, it will be found that less difference exists between their methods of treatment and the antiphlogistic, than is at first apprehended.

The circumstances which have generally exercised any influence in opposing the antiphlogistic method in the treatment

of puerperal fever, are the great weakness of the subjects in whom the disease takes place, the apparent or even actual weakness induced by the disease, the occasional recovery of patients thus affected without blood-letting, and the rapid progress and fatality of the disease, especially when epidemic, even when the antiphlogistic method is employed. To the first objection it may be answered, that disease never attacks unless when the system has been previously weakened in one mode or other, and the weakness of the subject is never a proper argument against the use of remedial means. To the second it is to be said, that whatever degree of oppression, languor, and debility a patient in puerperal fever exhibits, is to be ascribed to the violence of the disease and its disorganizing effects, and will disappear as that is removed, and as the effects are prevented from taking place. To the third objection it may be answered, either that the disease is so moderate as to be overcome by slight remedies and natural efforts, or that those which have been employed have had the effect of subduing inflammation. And to the last it may be said, that the progress of the disease is, in several instances, so rapid, that the measures have not time to operate, and in others that they have not been carried to a sufficient length.

The means which have been found most successful are, blood-letting, purgatives, antimonial medicines, and in some instances opiates ;—to which may be added oil of turpentine, internally and externally, cold applications to the belly, and the employment of mercury.

That blood-letting is a powerful and effectual remedy is shown not only by the experience of Hulme, Leake, and Gordon, but more recently by that of Hey and Armstrong. But in order that it be effectual, two things are requisite ; *first*, that it be carried to sufficient length, and *secondly*, that it be practised as early as possible, at the commencement or at least within the first twenty, in many cases within the first twelve, hours of the disease. On the quantity of blood to be taken a great revolution has taken place in this as in other inflammatory disorders. Thus Hulme and Leake talk of eight or ten ounces as a great bleeding, which will do much good ; whereas Gordon carried it to twenty and twenty-four ; and, as all his patients who were blooded to that extent in the beginning, had speedy and perfect recoveries, he did not think it expedient to carry it further. It is different with Armstrong and Hey, the

former of whom occasionally carried it to thirty ounces at the first, and the latter in one case to fifty-two ounces, (24th;) and I found it requisite to detract forty ounces from a plethoric young woman at once, with the best effect in puerperal fever. But though I mention these facts to give some idea of the quantity requisite to be taken in order to produce some check on the disease, it must not be imagined that it is possible to fix it in precise terms. In one subject sixteen or twenty ounces may produce as great an effect as thirty or forty in another, and the best rule is to bleed until we have proof that this effect is produced. The most decisive and least equivocal proofs are fainting either approaching or actually come on, and abatement or entire cessation of pain in the belly. If one blood-letting be not succeeded by one or other of these effects, a second, third, or even fourth at the interval of a few hours, ought to be practised. This is the manner in which Hey and Armstrong appear to have practised blood-letting, rather than by one copious evacuation; and in some instances fifty, sixty, or even eighty ounces of blood were lost before the disease began to yield. In one of Armstrong's cases fifty ounces were drawn in three operations, in another fifty in four operations, and in another by four copious bleedings, and two small ones, eighty ounces were lost before the abdominal inflammation was subdued. In like manner in one of Hey's cases thirty ounces within the first four hours were taken at one blood-letting, at a second ten, and at a third eleven,—fifty-one before the symptom of abdominal soreness had abated; yet, as pain returned, fifteen more ounces were taken from the arm, and a few from the belly, by cupping and leeches. In another case twenty-five ounces were drawn at the first; after the interval of a few moments nine ounces more; and before the arm was finally tied up six ounces more;—making in all forty ounces, after which the patient became faint, and the pulse fell from 112 to 88; yet pain recurred, and was relieved permanently only by taking eight ounces more about six hours after. In another (22d) twenty-four ounces were taken at the first, with the effect of causing faintness and reduction of the pulse from 100 to 72, and about twelve hours after, in consequence of the pain returning, twelve ounces more, in all thirty-six. In a fourth case, (25th,) five hours after the first sensations of pain, thirty-three ounces were taken from a large orifice, and quickly, with the effect of removing soreness and pain, but without causing fainting, and about twelve hours after twenty ounces

ere the symptoms of the disease were sensibly abated. In short, the simplest rule is to detract blood quickly and from a large opening, till the pulse becomes softer, or less frequent, or the pain is relieved, or the patient begins to faint. In some cases the pulse remains unchanged, or, instead of becoming slower, becomes quicker; and then it is best to be guided by the approach or occurrence of fainting, and alleviation of pain; and in the event of this last symptom, with or without quick pulse, recurring, it is always wisest to repeat the evacuation. If the pain and soreness of the belly be not removed or very materially alleviated in six hours, the blood-letting ought to be repeated; nor should a considerable degree of faintness, or even absolute *deliquium animi* warrant the opinion that further blood-letting is either unsafe or unnecessary, so long as pain of the belly continues.

The rapid course of this disease renders early blood-letting of the utmost importance. It is not well ascertained at what precise period of the disorder the inflammation may be incapable of being rendered amenable to suitable evacuation. Hey remarks, on this subject, that the disease may terminate fatally in forty-eight, or even in twenty-four hours, and he records one in which this took place in less than eighteen hours. But though these facts be of some consequence in showing with what promptitude remedial measures ought to be administered, they do not inform us how far blood-letting may be expected to be beneficial at any given period of the disease. The great point is to institute this remedy before effusion of sero-purulent fluid has taken place, or at least before it has gone to much extent; but as nothing very certain is known regarding this, further than that it will take place at different periods in different cases, it is manifest that no general rule can be established, and that the practitioner must draw his conclusions as to the propriety of using it, from the history of the case and the existing symptoms. Hey states that he knew blood-letting successful in a few cases in which a delay of more than twenty-four hours had been incurred, and he instances several of his own cases in which blood-letting was practised with success thirty, and even forty hours after the commencement. This delay, however, ought never, if possible, to be permitted to take place, and it is always desirable to institute the evacuation at least within twelve hours from the first sensations of pain in the belly. In cases where earlier notice is given, this evacuation

will be more effectual, the nearer it is performed to the commencement of the disease. The most difficult and delicate point is to determine when it is too late to practise blood-letting. It is evident that the longer it is deferred, the more violent and fixed will the disease become; and as its effects very early begin to take place in lymphic exudation, and sero-purulent effusion within the peritonæum, into the substance of the ovaries and the Fallopian tubes, the great object is either to prevent or to arrest this process by timely suspension of inflammatory action. For the purpose of establishing a rule as to the time and period of blood-letting, Armstrong has divided the disease into the two stages of excitement and collapse, in the first of which only this remedy is admissible. But as it may terminate in twenty hours, or extend to seventy in the acute forms of the disease, and is even more protracted in that which is termed subacute, it is obvious that no very precise rules can be derived from this principle. It is also to be remembered that, in not a few cases of puerperal fever, especially if attended with symptoms of uterine *phlebitis*, even the first or inflammatory stage presents so many marks of languor, oppression, and weakness, that an inexperienced observer might imagine the termination of the disease to be at hand when blood-letting, if not injurious, must at least be useless. It is therefore indispensable not only to attend to the existing symptoms, but to inquire into their previous course and duration. When this has been determined, blood-letting should be performed, only if pain of the belly be still felt, if the skin and extremities are not cold and moistened with sweat, and if there be reason to believe that effusion has not taken place or is inconsiderable. If, on the contrary, there is no pain but weight of the belly, if, with an extremely quick thready pulse, the extremities are cold and the person covered partially with chill damp sweats, and if the belly be distinctly distended with much sero-purulent fluid, no benefit can be expected from blood-letting.

Purgative Medicines.—Whatever dissent is entertained about venesection, almost all authors have agreed in the utility of purgative medicines. By those who condemn the former remedy, the latter have been commended as adequate to cure the disease if it be curable; and by those who employ blood-letting, they are employed as powerful auxiliaries. “Purging,” says Gordon, “is not so circumscribed in its application as bleed-

ing: for it is well adapted to all the different stages or periods of the disease, and is the evacuation to which nature herself gives the preference; being the only proper critical or salutary discharge that takes place in the puerperal fever." (92. 95.) And he afterwards justly asserts, "that though the cure turns upon bleeding, yet it is to be done *early* and *largely* or not at all; that purging can never be omitted with impunity; and that if any one neglect to excite an artificial, or venture to restrain a spontaneous, diarrhœa, he will certainly lose his patient." The occurrence of looseness with dark-coloured fetid excrements, or frothy slimy discharges, has been noticed by all writers from Denman, Hulme, (84), and Leake, (124), to Gordon, Hey, and Armstrong; and Leake has attempted to draw a distinction between *symptomatic* and *critical diarrhœa*. Whether it be practicable in all cases to establish a distinction of this kind, is perhaps of no great consequence; but there is no doubt, that the best means of obviating the symptom and controlling the morbid discharge is to keep up a steady, effective, and continued action of the intestinal mucous membrane by the exhibition of purgatives. This plan should be commenced immediately after blood-letting, and continued until every vestige of local uneasiness, or of general disturbance, has disappeared.

It is perhaps of no great consequence what remedies are selected for this purpose, provided such be chosen as have effectual power in unloading the intestines and the intestinal vessels. A well founded popular prejudice has long existed in favour of treating women in childbed with castor oil; and perhaps this medicine should be first employed, because most reliance can be placed on it for emptying the bowels. The action thus begun may be afterwards sustained by those substances which at once unload, and produces serous or fluid stools. After many trials, Gordon found that a combination of calomel and jalap was the medicine most to be depended on; and this inference the subsequent experience of others tends to confirm. Armstrong proposes to give calomel in pill doses first, and when the bowels have been thus opened, to keep them so by castor oil or any similar aperient, until the stools become natural. He administered sometimes a scruple or half a drachm of this mineral at once with the most salutary effects. This method of treatment, however, was found by Dr Labatt of the Dublin Lying-in Hospital to produce alarming weakness, a

tympanitic state of the abdomen, with vomiting and great irritability of the stomach; and it is certainly not a practice suited for general adoption. When the bowels resist a six or ten grain dose of calomel, either blood-letting ought to be repeated, or a full dose of castor oil, or infusion of senna, should be given. It is for this reason that I think the common purgative remedies are the most suitable.

Denman first bore testimony to the benefit derived from antimonial medicines in the treatment of puerperal fever; and he was followed by Hulme, Leake, Kirkland, and Hull. The preparation selected was tartar emetic (*tartras antimonii potassæque*,) either alone in solution, or with chalk, as ordered by Denman. It does not appear that, in all instances, any precise object was kept in view; for by some it is recommended to excite vomiting and evacuate bile, by others for a purgative effect, and by others, as Kirkland and Walsh, for producing sweating. On this point it may be remarked, that it is rarely requisite or desirable to cause vomiting in the treatment of puerperal fever; the bowels may be opened with greater certainty by means of any of the ordinary cathartics; and the sole object with which, in the present day, antimonial medicines should be administered is to produce sweating, and that general relaxation of the capillary vessels which favours the cessation of inflammation. With this view, either tartar emetic or ipecacuanha, as recommended by Doulcet and the French Academy, may be given; but it is in most cases expedient to produce this effect in a different mode, which I have now to notice.

Opium and its preparations.—Opium, either in substance or tincture, and in general with antimony, was recommended by Hulme and Leake, with the view of producing sweating without heating or binding the bowels, and alone, as a means of checking diarrhœa by the latter. By Clarke of London, it was recommended for abating pain, and inducing sleep, either alone or combined with bark. Gordon used it at bed-time to procure sleep, and a respite from the action of the purgatives, and enable the patient, as he thought, to undergo the evacuations of the ensuing day. To this practice Hey is strongly and decidedly opposed, and perhaps with some reason; for though he frequently tried opiates in the Leeds epidemic, it was never with advantage. The respite they afforded, he says, was insidious, and tended rather to prolong the disease. Notwithstanding the force of this testimony against the use of opium, Armstrong

found it beneficial, and was led to place considerable reliance on its power. "In puerperal fever, in which the *peritoneum* chiefly sustains the intensity of the inflammation, opium may often be given with considerable advantage, where the local pain and constitutional irritation are excessive;" (p. 164) and he remarks, that though bleeding and purging are the principal measures in the early stage or that of excitement, yet afterwards, on the approach of the latter or sinking stage, when bleeding is injurious, opium is the principal remedy for allaying irritation. The rule of its exhibition will be best understood from attending to its effects, which vary according to the circumstances under which it is administered. If given in the beginning of the disease previous to blood-letting, it increases the heat, thirst, and restlessness of the patient. It does not permanently relieve local pain, but merely diminishes the sensibility of the patient to her sufferings; and it renders the bowels insensible to the natural impression of their contents, and to the artificial one of purgative medicines. If given after copious blood-letting it renders the pulse much slower and softer, the skin moist and cool, and disposes to sleep; it relieves pain or soreness of the belly, and in general facilitates the action of purgatives; and, lastly, it banishes that extreme nervousness and mobility which is common in women in childbed, and almost invariably follows great discharges of blood, whether spontaneous or artificial. In many cases of puerperal fever after copious blood-letting, amounting to thirty-five, forty, or fifty ounces, though the pain is abated or entirely gone, the pulse is as quick as ever, or quicker, fluttering and small, the countenance is pale, ghastly, and affrighted, the patient passes from one fainting fit to another, is restless and cannot sleep, raves incoherently, or may be convulsed; at the same time, the skin is partially moistened with a chill sweat, the bowels appear to have lost all power, and with a great desire nothing is voided, or their contents are discharged involuntarily. In such a state two grains of solid opium, or a drachm of the fluid tincture, or of Battley's solution, or the solution of muriate of morphia, will be followed with the most beneficial change. Drowsiness comes on, and is soon succeeded by sleep; the skin becomes gradually warm and moist; the features become more lively and perfectly calm; the pulse becomes slower, fuller, and softer, often thirty beats less; and the patient awakens in about six or eight hours free from com-

plaint, and greatly refreshed. If given in the termination of the disease, where blood-letting has been neglected, its effects are limited to relieving pain and procuring sleep. According to these facts it may be established as a rule, that opium ought not to be given in puerperal fever till local pain has disappeared either under the use of blood-letting, or by other means, or spontaneously; that after copious depletion it may be given with great benefit and marked good effects; that in the latter part of the disease its effects are merely palliative; and that in the convalescent stage it may be given occasionally for procuring sleep, and obviating internal congestion.

Oil of Turpentine.—The next remedy of which I shall speak is the volatile oil of turpentine. This agent was first brought under the notice of the profession in the treatment of puerperal fever in 1814, by Dr Brenan of Dublin, who had found it of signal efficacy in doses of a table-spoonful or one ounce given internally and applied externally, in a violent and fatal epidemic which raged in that city in the year 1812.* It was afterwards employed with the same intention, and, according to the accounts, with equally beneficial effects, by Mr M'Cabe,† Mr Atkinson,‡ Mr Payne,§ Mr Edgel,|| Mr Parkman,¶ Mr Johnson, Dr Dewees, ** Mr Warder, †† and Dr Bateman, and its therapeutic effects became the subject of a good thesis, published at Paris in 1830, ‡‡ by Dr Simao-José Fernandez, a young Portuguese physician.

With the view of removing or assuaging the symptoms of puerperal *peritonitis*, Dr Brenan administered the oil of turpentine both internally and externally. In none of the cases could it be said to be the sole remedy, for in all blood-letting was either premised or local blood-letting accompanied and followed the use of the oil of turpentine, and in general before the use of the remedy cathartics or some other means of relief,

* Thoughts on Puerperal Fever, and its Treatment by the Oil of Turpentine, by John Brenan, M. D. London, 1814, 4to.

† The London Medical Repository, Vol. vi. p. 460.

‡ Medical and Physical Journal, Vol. xxxiii. p. 447.

§ Edinburgh Medical and Surgical Journal, Vol. xxii. p. 53.

|| The London Medical and Surgical Journal, Vol. xxxviii. p. 447.

¶ London Medical Repository, Vol. xiv. p. 464.

** London Medical and Surgical Journal, Vol. iii. p. 39. †† Ibid. p. 51.

‡‡ De la Peritonite Puerperale et en particulier de son traitement par l'essence de terebinthine; par Simao-José de Torres Novas en Portugal. Paris, 1830, 4to.

had been employed, though often with very little influence on the symptoms.

When the remedy was given internally, the dose was from three tea-spoonfuls to a table-spoonful, or one ounce in warm-sugared water; and in general the first dose was followed by remarkable alleviation of the pains, cessation of the vomiting, and gradual convalescence. In several cases, however, it was requisite to repeat the administration of the remedy.

Along with the internal administration of the oil of turpentine, Dr Brennan applied the remedy warm by means of flannels over the belly. The effect of this application was often to induce considerable superficial pain and redness.

From the subsequent trials of this agent by the various practitioners above-mentioned, it appears to have, on certain occasions, contributed to alleviate the intensity of the symptoms of puerperal *peritonitis*. It does not appear, however, either to be alone adequate to the cure of this disease, nor to possess any specific powers over the morbid action. It is by no means even always capable of assuaging the violence of the vomiting or the abdominal pains. Its great utility appears to be in producing a strong and powerful irritation of the intestinal mucous membrane, and sometimes the urinary passages, and thereby of alleviating the intensity of the morbid action going on in the *peritoneum*. It is also much more efficient in producing this result after the intensity of the disorder has been abated by means of blood-letting and active cathartics, than before these measures have made a deep and decided impression on the system and on the disease. In the trials which I have myself made, I have invariably found its beneficial effects to depend upon this preliminary condition; and hence I must say, that it is only after copious blood-letting, and the energetic use of cathartics, that the oil of turpentine can be used with benefit. It may then be given in doses of from half an ounce to one ounce every second hour, while pain and the tympanitic state of the abdomen continue; and it may at the same time be applied externally and injected into the rectum and colon.

In general, however, I find that the best external applications are cloths wrung out of cold water, or the revellent influence of the blister.

Another agent, the therapeutic powers of which have been very strongly commended, is mercury, administered either in-

ternally, or by inunction, so as to produce constitutional effects. The employment of mercurial frictions in the treatment of puerperal fever was tried to a great extent by M. Guersent, (*Archives Gen. de Med.* xv. p. 385. Paris, 1827.) and M. Velpeau, (*Archives Gen.* xix. p. 535. Paris, 1829.) and commended as a most certain remedy by the latter. This mineral was used by Desormeaux, both by friction with strong mercurial ointment, and also by the internal administration of calomel. The former was rubbed along the interior of the thighs to the extent of from two to three ounces daily; and the latter was exhibited in doses of from eight to ten grains daily, in conjunction with opium or extract of henbane. (*Archives Gen. de Med.* xxiii. p. 42.)

According to Velpeau, who is by far the most enthusiastic advocate for this mode of treatment, if, after the use of moderate blood-letting in the robust, but without this condition in the delicate, frictions, with two or three drachms of mercurial ointment every two hours, are performed steadily and diligently over the belly, and calomel has been given to the extent of two grains every two hours, to act as a purgative, or in its stead castor oil or Sedlitz water, the bowels are freely opened, with alleviation of the pain, tension, and tympanitic state. To affect the mouth, he allows, is not requisite to the therapeutic result; but ptyalism, he remarks, is always, in such cases, a favourable circumstance.

The treatment of mercurial frictions in the manner now specified, M. Velpeau thinks, is equally adapted to simple *peritonitis* and *metro-peritonitis*, and uterine venous inflammation. Even in those pernicious and almost invariably fatal cases, in which purulent matter is already within the veins, and is mixed with the blood, and giving rise to the symptoms of depression and exhaustion characteristic of this accident, he expressed the confident opinion, that general blood-letting, mercurial frictions and calomel, will form one of the best means to be employed in counteracting the progress of the malady.

As a proof of the efficacy of this mode of treatment, he adds, that though in the spring of 1828, 220 patients died of puerperal fever at the Maternité of Paris, in the course of two or three months only, under the ordinary treatment, yet in the same conditions, in the most severe cases, the mercurial treatment, with or without blood-letting, had given 14 successful

cases among 19; and in the unfavourable cases, the cause of fatality could be ascribed to circumstances unconnected with the efficacy of mercury.

M. Tonnellé, who speaks as the representative of the views of M. Desormeaux, is much less sanguine. He allows that he has often seen mercurial frictions successful, but much more frequently unavailing, in removing the symptoms of puerperal fever. But he does not, therefore, recommend its rejection.

The expectations, however, thus confidently announced abroad, have not been realized in this country. Neither Dr Lee, nor any other practitioner here, has derived from the use of mercury given to affect the system, the favourable results obtained by M. Velpeau, nor even the small degree of success obtained by M. Desormeaux. I must also be permitted to express my doubt, notwithstanding the authority of M. Velpeau, whether such an agent as mercury can stop the progress, or counteract the effects, of such morbid actions as suppurative inflammation of the veins, suppuration of the ovaries and Fallopian tubes, or gangrenous mollescence of the womb. I am not aware that the *Materia Medica* possesses as yet any agent to which we can ascribe such extraordinary powers.

§. VI. Acute Inflammation of the Liver; Inflammation of the Hepatic *Peritoneum*. Hepatic *Peritonitis*. *Peritonitis Hepatica*. *Hepatitis Acuta*. Sauvages; Cullen, &c. *Sero-Hepatitis*, G. H. Bell.

Baillie, chap. ix. p. 213, &c.—Pemberton's Practical Treatise, 2d edit. chapter ii. p. 19.—A Treatise on the Diseases of the Liver and on Bilious Complaints. By George Hamilton Bell, F. R. C. S. 8vo. Ed. 1833.—Clinical Illustrations of the more important Diseases of Bengal, &c. By William Twining, M. R. C. S. 2d edition, Vol. i. Calcutta, 1835.

NOSOLOGICAL AND ANATOMICAL CHARACTERS.—“It seems probable,” says Cullen, “that the acute *hepatitis* is always an effusion of the external membrane of the liver.” (418). It is certain that the peritoneal covering of the liver is liable to inflammation, either separately or when the general peritoneal surface is inflamed, and that it gives rise to morbid products similar to those formed by other serous membranes in a state of inflammation. This inflammation, when confined, as now stated, to the hepatic *peritoneum*, may either occupy the whole of that division of membrane, or may be confined to that which covers

the anterior or convex surface of the liver, which is said to be most common. It may also take place on the concave side, where it is in contact with the stomach and *duodenum*.

I have several times seen adhesions of false membrane connecting the superior or convex surface of the liver to the inferior or concave surface of the diaphragm; and these adhesions must have been formed by lymph effused by the hepatic *peritoneum*, or the diaphragmatic or both when in a state of inflammation.

Albuminous exudation and adhesions also take place at the anterior margin and along the lower or concave surface of the liver from various causes.

1. In simple circumscribed ulceration of the stomach, as already described in this work, (Vol. i. p. 885,) when the gastric peritoneum becomes inflamed, the inflammation extends to the hepatic peritoneum of the concave surface, generally on the left lobe, and lymph is extensively effused all round, sometimes with serous or sero-purulent fluid. This effusion, and the consequent adhesion, prevents the escape of the contents of the stomach into the abdominal cavity, and prolongs life. This union I have had occasion to see more or less complete now in five cases.

2. Inflammation may attack the hepatic *peritoneum* at the anterior-inferior margin of the right lobe, either along with, or in consequence of, inflammation of the peritoneal coat of the colon, or even the pyloric end of the stomach. The former is the most common. A good specimen of this I had occasion, on the 10th of this month, to observe, in inspecting the body of a man, destroyed by continued fever. A band of firm false membrane, about two inches broad, and from three to four inches long, extended from the anterior margin of the liver and the fundus of the gall-bladder to the transverse arch of the colon, about one inch to the left of its angle, and connected that bowel firmly to the liver and gall-bladder. Instances even are recorded in which, in consequence of biliary calculi ulcerating a passage out of the gall-bladder into the intestines, similar adhesions had been previously formed between the peritoneal coat of that organ and the peritoneal covering of the bowels. Similar inflammation and adhesion take place in India in consequence of disease of the colon and cæcum.

3. Inflammation of the hepatic *peritoneum* of the inferior sur-

face of the liver may arise either spontaneously, or from some cause of irritation in that region, as biliary *calculi* sticking in the gall ducts, or inflammation of the *duodenum* or *jejunum*, spreading to the capsule of Glisson. In all these cases the same effects are produced. The membrane becomes injected, vascular and rough, and afterwards effuses albuminous exudation, which unites the contiguous organs by adhesion.

In all the cases now mentioned, hepatic *peritonitis* arises from some morbid cause applied to or seated in the membrane. But it may be also the result of another cause seated in the hepatic substance. When the substance of the liver is inflamed, whether it proceed to suppuration or not, it is a very common consequence for the peritoneal covering over the inflamed or suppurating portion to become red, injected, and at length covered on its free surface with albuminous exudation, which more or less quickly unites the membrane with the organs to which it is applied. It may hence be said that though hepatic *peritonitis* may often take place without inflammation of the hepatic substance, the latter is almost never inflamed without being followed or accompanied by hepatic peritoneal inflammation.

The hepatic *peritoneum* is, like other parts of that membrane, liable to be affected with cartilaginous or osseous degeneration, and it is occupied with minute hard semitranslucent tubercles, when the peritoneum is affected by these bodies. All these conditions are liable to be attended with inflammation of the membrane, that is, redness, congestion, roughness and exudation of coagulating lymph, but which is slow in progress, and in other respects of a chronic character.

SEMIOGRAPHY.—The important question which the physician has to consider is, whether the disease, the anatomical characters of which have been now stated, gives rise to symptoms which possess any distinctive character; whether it invariably produces external symptoms; and whether these symptoms are so peculiar that the physician can during life distinguish hepatic *peritonitis* from inflammation of any other part of that membrane on the one hand, and from inflammation or other diseases of the hepatic substance on the other. This question it is by no means so easy to answer as might be imagined from the statements of various systematic authors.

In the *first* place, it is certain that inflammation of the hepatic *peritoneum* of the upper convex surface of the liver oc-

asionally takes place, and passes through all its stages to complete adhesion, without giving rise to much uneasiness or well-marked symptoms; for after minute inquiry in regard to the subjects of several of the cases first mentioned, I found that no evidence could be obtained that the individuals had suffered so much as to render them the object of particular attention.

In the *second* place, I have remarked that, in the cases of hepatic *peritonitis* ensuing on ulcerative destruction of the stomach which have come under my own observation, pain or much uneasiness was by no means a uniform symptom, and whatever other phenomena took place in the state of the respiration or the pulse, pertained as much to the lesion of the stomach and general *peritoneum*, as to that of the hepatic *peritoneum*. There are sometimes slight feelings of gnawing uneasiness; but whether these were referable to the state of the stomach or the hepatic *peritoneum*, I have been unable to ascertain.

In the *third* place, I have treated a considerable number of cases in which the prominent symptoms were pain, more or less acute, in the right hypochondriac region, and in the epigastric, with febrile symptoms, with or without jaundice; and as these cases recovered under the use of various remedies, chiefly antiphlogistic, it is impossible to say positively whether the symptoms arose from inflammation of the liver or the hepatic peritoneum. In two cases there were yellowness of the surface, bile in the blood and urine; and in one of these cases I obtained cholesterine from the *serum*. In this case the disease began with acute twisting pain in the belly, which was aggravated by the slightest pressure, similar to that of general *peritonitis*; and from the course of the symptoms, I inferred that the disease actually began in the peritoneum of the jejunum and ileum or transverse colon, and then affected the capsule of Glisson and the hepatic peritoneum of the concave surface of the liver.

From these facts, and others which have occurred to me in observing this disease, I think the history of the symptoms may be traced in the following manner.

Though hepatic *peritonitis* may sometimes take place without very well-marked symptoms, it is generally accompanied with more or less intense febrile symptoms (*synocha*,) of the usual inflammatory type. The pulse is quick, strong, hard

and full ; the skin is hot and dry ; the bowels are constipated often obstinately ; and the urine is scanty and high-coloured. Pain, more or less acute, is felt in the right hypochondriac and right side of the epigastric region ; and the pain is aggravated by pressure, deep inspiration or coughing. Breathing is also difficult, short, and thoracic ; and if the respiratory motions of the chest and belly be observed, it is found that the right side of the chest is moved chiefly by the intercostal muscles, while the abdomen on the right side moves little or not at all.

The mode in which the patient lies, and the position in which he suffers least pain, are also important to be observed. When the inflammation is on the hepatic peritoneum of the right side, the pain is greatly aggravated by lying on the left side. While the hepatic peritoneum of the left lobe is affected, the pain is most aggravated by lying on the right side. But when it is general the patient feels most ease in lying motionless on the back.

Hepatic *peritonitis* has been also represented to be attended with cough, which generally is dry, but may sometimes be moist. In the first case, it is believed to depend on inflammation of the inner surface of the liver irritating the diaphragm ; in the second in general inflammatory diathesis affecting the diaphragm. It is properly remarked by Pemberton, that it is not in the early stage of the disease a necessary or uniform symptom ; and that it is only about forty-eight hours after the commencement of the attack that cough appears. I think, that in general, when cough appears as a symptom of hepatic disorder, it proceeds either from irritation of the diaphragm, or is a symptom of inflammation of the hepatic substance rather than of the peritoneum, the vascular congestion of the liver then acting as a means of inducing pulmonary and bronchial congestion and irritation, by preventing the easy and prompt return of blood from the lungs.

The pain is represented to be frequently felt at the clavicle and the top of the shoulder (*acromion* ;) and it has been said to be in some cases attended with hiccup, and even with vomiting. The sensation of pain at the top of the shoulder is not established as an indisputable fact. But when it has been felt, its occurrence has been referred to the circumstance of the connection between the morbid irritation of the extremities of the phrenic nerves, and their connection with the cervical part of the spinal chord and axillary nerves. By the same means

the occurrence of hiccup, which has been believed to depend on irritation of the diaphragm, has been explained; and vomiting is perhaps merely an irritation of the same muscle, or of the stomach by contiguity.

It thus appears that several facts are doubtful; and that of these facts, though uncertain, explanations have been offered. I believe that the only safe method of forming a diagnosis is to avoid trusting to any single symptom; and to take the whole in a united body; and, above all, to employ active remedies, and observe carefully the influence of these remedies both in the general and the local symptoms.

When yellowness or jaundice does take place, it is believed to depend on inflammation of the concave surface spreading to the gall ducts, in which slight swelling causes obstruction. (Cullen, 418. Pemberton, ii.)

DIAGNOSIS.—This disease is also liable to be confounded with pleurisy, and both Baillie and Pemberton have attempted to establish diagnostic marks. According to the former, the pain is less increased by deep inspiration when the hepatic peritoneum is inflamed, than when the right *pleura* is affected; and pain is much increased by pressure under the margin of the ribs, which will not take place in pleurisy; to which Pemberton adds, that in *hepatitis* cough succeeds the pain several days, whereas in pleurisy it either precedes or accompanies the pain. It must also be carefully distinguished from gastritis, general peritonitis, and the symptoms occasioned by the descent of gall-stones. According to Pemberton, inflammation of the liver may be distinguished from spasm of the gall ducts, by the absence of squeamishness (*nausea*), by the permanence of the pain, by the pulse being upwards of 100 in a minute, and by the patient observing a straight quiescent posture, whereas in spasm of the gall ducts, the greatest ease is obtained by bending the body forward on the knees.

TERMINATIONS.—Inflammation of the hepatic *peritoneum* may, like other serous inflammations, terminate in resolution or exudation of lymph and adhesion of contiguous surfaces, in sero-purulent or purulent effusion, and ulceration of the containing tissues. The tendency to either of these results may be inferred from what has been already stated in treating of general peritoneal inflammation.

The termination by resolution has been stated by systema-

tic authors to be accompanied or followed by various discharges which have been styled cortical. Of this kind are hemorrhage from the nose (*epistaxis*), or from the hemorrhoidal vessels (*hemorrhoids*), bilious diarrhœa, profuse sweating or hypostatic urine more or less copious. In some instances its disappearance has been said to be attended with the appearance of rose (*erysipelas*), in some external part of the body. In all these cases, I have no hesitation in stating my decided opinion, that the disease has been confounded with inflammation of the substance of the liver, in which only these critical discharges are observed.

It has been also taught by Cullen, that when the disease terminates in suppuration, the matter may be discharged by the biliary ducts; or if the suppurated part do not any where adhere closely to the neighbouring parts, the matter may be discharged into the cavity of the abdomen. I may here say, that all these forms of termination apply solely to inflammation and suppuration of the hepatic substance. If inflammation of the hepatic peritoneum terminate in suppuration, the matter is either effused within the general cavity of the *peritoneum*, or it is confined within a separate cavity, the walls of which are formed by lymph effused and coagulated so as to confine the matter. Even in the case in which the matter gives rise to a perceptible external swelling, it is generally, nay I should say invariably, contained within a cyst formed in the manner now specified. To the case of matter forming on the convex surface and passing through the diaphragm and *pleura* into the right lung, and the analogous case of its finding its way into the interior of the stomach or bowels, the same observations, I believe, are applicable. The whole of these terminations must have occurred, and I shall show do occur, in cases of inflammation and suppuration of the substance of the liver.

ETIOLOGY.—The remote causes of *hepatitis* are not always to be discerned, and many have been assigned on very uncertain grounds. Nor have particular physicians, in attempting to discover the circumstances which favour the inflammation of the hepatic *peritoneum*, distinguished in all instances between this and inflammation of the substance of the organ. Thus Cullen assigns eight causes, the operation of which he thinks is frequently evident; but it is consistent with observation to assert, that several of these do not produce acute inflammation

of the membrane, unless by previously inducing inflammation of the hepatic substance. Thus, if we except external violence directly applied, violent exercise, great heat, or the application of cold, it is difficult to specify any agents which induce this inflammation other than those which induce membranous and especially peritoneal inflammation in general. According to Mr G. H. Bell, the most common cause of hepatic *peritonitis* within the tropics is violent exercise during the heat of the day, and partial exposure to wet; as in snipe-shooting. That acute, that is the peritoneal inflammation, is often induced by chronic or the proper hepatic inflammation, is an observation of Cullen, the truth of which is daily experienced in those cases of chronic inflammation which terminate in abscess.

TREATMENT.—The cure of hepatic peritoneal inflammation is to be attempted by strict adherence to the antiphlogistic diet, by bleeding largely from the system, by local bleeding either by leeches or cupping, by derivation by means of the application of blisters, and by the administration of purgative medicines.

From an adult sixteen or even twenty ounces of blood should be taken from the arm, and any purgative ordered which will effectually open the bowels. The blood first drawn is rarely sizy, so that no conclusion as to the severity of the disease can be drawn from this circumstance. But if after twelve or sixteen hours, when the first blood-letting has been aided by the operation of the cathartic, the pain be not diminished, and the pulse become more natural, blood to the amount of twelve, fifteen, or twenty ounces, according to its effects, should again be taken from the arm, and it will at the same time be expedient to apply a large blister to the whole of the right hypochondre. The purging should be continued, so as to cause several fluid stools in the course of the day. In general, after the second blood-letting, at farthest after the third, a decided effect is produced on the disease; the pulse becomes less frequent and softer, the patient can lie on either side, and bear pressure without inconvenience, and, his thirst abating and skin becoming moist, the tongue is less furred, and a desire for food returns. If, however, these favourable changes are not effected, blood-letting may be again repeated to the effect of causing slight fainting, or if this be judged inexpedient, if the pulse is slower, but the pain of the side is

still felt, eighteen leeches may be applied to the right hypochondre, or ten ounces of blood may be abstracted by cupping. Active purging must also be continued, and, indeed, ought never to be given up, so long as the tongue continues furred, and the skin is warmer than natural. In general, this mode of treatment will be sufficient to control ordinary cases of peritoneal hepatic inflammation in the course of five or six days time; and though there can be no harm in repeating the local blood-letting and continuing the exhibition of purgatives after this period, yet, if the symptoms continue, there is reason to apprehend that the inflammation is either spreading to the substance of the organ, or is terminating in suppuration of the peritoneal coat, or is about to pass into a chronic tubercular disease of this membrane.

In the first case, little peculiarity of practice is requisite. Calomel and other mercurial preparations have been recommended in the early stages of inflamed liver; and perhaps it may be advisable to try the mineral under such circumstances. As a purgative, it has no advantage over the neutral salts and the gum-resins; as an alterative, it is inadmissible in the strictly inflammatory and early period of the disease; and wherever the mere membrane is affected, there is nothing to recommend either calomel, or the blue pill, or the mercurial ointment. But, as it may be difficult to know, after pungent local pain has been relieved, and the general fever has been subdued by copious and suitable depletion, whether the remaining complaints of the patient may not depend on the inflammation spreading to the substance of the liver, it may be advisable to combine with the local blood-letting and purgative medicines, two grains of calomel, or half a drachm of mercurial ointment every night to be rubbed upon the side. This measure is only to be resorted to, if other means of counter-irritation and depletion fail; and if under its use any slight pain or uneasiness be diminished without augmenting febrile heat or disturbance, it may be continued, according to Pemberton, for eight or ten nights, after which it may be gradually laid aside. If, on the contrary, local pain or general fever be reproduced, it should be instantly abandoned as injurious.

The cases which I have seen incline me to think, that low diet, occasional local blood-letting, and revulsion by blistering, with unremitting attention to the evacuation of the bowels, will be

sufficient to subdue every remaining trace of the disease, unless suppuration has actually taken place. It is sometimes beneficial, at the same time, to order, three times a-day, about two ounces of a slight infusion of some bitter, as quassia or gentian, with a proportion of neutral salt sufficient to procure one alvine evacuation; and the diet may be slowly and cautiously improved by the addition of broths or soups till the patient is restored to perfect health.

This may be considered as the course and treatment of the disease, in ordinary circumstances, occurring in a strong and otherwise healthy subject; but it not unfrequently attacks persons whose general strength is impaired by irregularity and the chronic form of the disease, and who are therefore ill calculated to bear those active measures which are necessary for removing the complaint.

If the disease come on suddenly without previous illness,—if the subject attacked be otherwise healthy and vigorous,—and if the buff on the blood be compact, firm, and opaque, active measures may be pursued with benefit, and a favourable issue may be anticipated. But if the disease come on slowly and insensibly,—if it have been preceded by a train of bad health, and occur in an emaciated languid subject,—and if the buff be semitransparent, jelly-like, greenish-yellow, and striated, it is manifest that the vital and animal powers are so impaired that active depletion must either be pursued with caution, or will be attended with less beneficial results, and the termination may be unfavourable. In such circumstances, if, while the general strength is much impaired by the necessary evacuations, the local pain and constitutional disturbance or general fever are not sensibly abated; or if the pain merely be abated, while the pulse becomes more frequent, the violence of the inflammation may be inferred to be unsubdued, and resolution can scarcely be expected. If partial sweats about the head and face come on, they are believed to indicate approaching suppuration, which is always an unfavourable result, and to be prevented if possible. Of course, much will depend, in forming this opinion, upon the period of the disease at which they occur.

If the symptoms clearly indicate that matter is formed, it is recommended to abandon the antiphlogistic plan and support the strength of the patient by bark, cordials, and a nourishing though mild diet. The right side and posterior part of the

chest and loins should be minutely examined, and the moment any tumour which communicates a sensation of fluid is discovered, it may be expedient to puncture it by a small orifice, after which the patient may be treated according to the principles of surgery. If the matter finds its way in any other direction, it is obvious that no interference can be attempted. The business must be left to the natural surgeon, adhesion and granulation; and the duty of the physician is confined to the prevention of any improper interference, and to the management of bowels and general health of the patient.

When the matter finds its way through the diaphragm, it may escape into the *pleura* and cause fatal pleurisy; it may burst into the lungs and bronchial tubes, causing immediate suffocation; or it filters through innumerable small orifices, and is spit up gradually for weeks. This occurrence may give the patient some chance of recovery; but more commonly, after being worn down by incessant coughing and hectic fever, he sinks under the disease. On this head, however, I refer the reader to the section on hepatic inflammation.

§. VII. *Splenitis Peritonealis Acuta. Peritonitis Splenica*.—The peritoneal covering of the spleen is liable to inflammation when this membrane is inflamed; and, according to Baillie, the proper capsule of the organ may partake of the disease. I have met with only one case in which the free surface of the splenic *peritoneum* had secreted a considerable quantity of lymph and purulent matter, the former adhering to the membrane, the latter lying partly between the diaphragm and the spleen, partly between the latter organ and the left kidney. It is said to give rise to the usual symptoms of pain in the left hypochondre, increased by pressure, sometimes sickness, and increased frequency of pulse. In the instance, however, to which I now refer, the patient had not complained of uneasiness or any painful feelings which could lead to the suspicion that inflammation of the splenic *peritoneum* was going on.

When pain in the left side leads its presence to be suspected, it requires the same treatment as other forms of peritoneal inflammation, namely, blood-letting, general and local, purging, and low diet.

CHAPTER IV.

INFLAMMATION OF CELLULAR MEMBRANE AND ADIPOSE
MEMBRANE.§. I. Inflammation of Cellular Membrane or Filamentous Tissue.
Phlogosis. Phlegmone.

Remarks on the Cellular Membrane and some of its Diseases, by William Hunter, M. D., in Medical Observations and Inquiries, Vol. ii. Art. ii. p. 26. London, 1762.—Chirurgical Observations and Cases, by William Bromfield, Surgeon to her Majesty, &c. In two volumes. London, 1773. Vol. i. Chapter iii. p. 92.—An Inquiry into the present state of Medical Surgery, by Thomas Kirkland, M. D. passim. London, 1783.—Of the different kinds or species of Inflammation, and of the causes to which these differences may be ascribed, by James Carmichael Smyth, M. D., in Medical Communications, Vol. ii. Art. xix. p. 190. London, 1790.—A Treatise on the Blood, Inflammation, and Gunshot Wounds, by the late John Hunter. London, 1796. passim.—An Essay on Phlegmatia Dolens, &c. by John Hull, M. D. Section 3d, p. 204. Manchester, 1800.—The Chirurgical Works of Percival Pott, F. R. S., &c. In three volumes. Vol. ii. London, 1808. Vol. iii. *Fistula in Ano*. Sect. i. ii. iii. and iv.—Some observations in Surgery, illustrated by Cases, by A. Copland Hutchinson. London, 1816. On the Treatment of Erysipelatous Inflammation, p. 76. 2d. edit. London, 1826.—Cases of Diffuse Inflammation of the Cellular Texture, with the appearances on Dissection, and Observations, by Andrew Duncan, Junior, M. D. &c. &c. in Transactions of the Medico-Chirurgical Society of Edinburgh. Vol. i. p. 470. xxii.

INFLAMMATION of cellular or filamentous tissue, in consequence of its superficial situation, and the local effects to which it gives rise, has generally been referred to the province of surgery. As, however, it is not invariably a local disease, and as it is more or less closely allied in general character with inflammation at one time of membranous parts, at another of solid or compound organs, it is necessary to notice briefly its pathological and physical characters in this place.

Filamentous tissue is liable to inflammation of two sorts at least, the limited or circumscribed, and the diffuse or spreading. In the first, the morbid process is confined with more or less accuracy to a definite spot, the circumference of which is marked by the effusion of coagulable lymph; in the second it is spread or diffused over a considerable extent, and there is either no effusion of lymph, or it is partial and scanty, and imperfect.

When the inflammation is circumscribed, it constitutes the disease to which nosological and practical authors have given the name of *phlegmon* (*φλεγμονή*; *phlegmone*,) converting in this manner, after the example of the Greek physicians, what was first used as a generic into a specific or individual term. It is indeed true that Cullen applied this term in a different sense, when he said that in phlegmon, "the inflammation seems to affect especially the vessels or the internal surface of the skin, communicating with the lax subjacent cellular texture." (275.) But it is also to be remarked, that William Hunter admitted, that, considering the universality of this membrane, it would hardly be otherwise than that it should be the seat of abscess, the consequence of phlegmon; and while John Hunter, throughout his pathological reasonings, implies the same opinion, Dr Carmichael Smyth states it in express terms. "I have said that the phlegmon is the inflammation of the cellular membrane, meaning to include under the name not only the membrane itself, so called by anatomists, but likewise the adipose membrane, together with the glands and the viscera; these having a similar loose spungy texture, consisting principally of cellular membrane, connecting an infinite series of minute blood-vessels and nerves." (p. 191.) Though this practice be not only very common but sanctioned by names of considerable authority, various reasons, both anatomical and pathological, convince me that it is erroneous, and compel me therefore to reject it. I have in another work considered the anatomical characters and pathological relations of the filamentous tissue, and those of the adipose membrane as altogether distinct; and to that I refer for the detailed explanation of the differences. Meanwhile, it is here sufficient to observe that the filamentous or cellular tissue should not, as has been done by Dr Carmichael Smyth, be confounded with the adipose membrane either in healthy properties or in morbid relations. It differs in anatomical position, and in physiological properties. And when affected with inflammation especially of the circumscribed form, not unfrequently with lymph, is effused within its interstices first in a fluid form, and this is gradually separated into two parts,—the solid forming coagulable lymph, the fluid forming serum. This constitutes the tumour called phlegmon.

Hunter advanced the proposition, that the first effect of in-

flammation in this tissue was effusion of lymph and adhesion, (Chap. ii. Sect. iv. p. 241,) and subsequently is at much pains to explain the final intention or cause of this adhesion, by ascribing to it the limitation of the inflammatory process. There is no doubt, however, that though this effusion be at once an effect and a character of the inflammation, it cannot be admitted in every instance as a proof of the existence of a final cause. But the first question which the pathologist must propose to himself is, what is the cause of this effusion, and is there not an anterior state from which this effusion of lymph proceeds? Observation, aided by morbid anatomy, tells us that there is an anterior state, and that this consists in extreme accumulation of blood within the vessels of the part; and, in point of fact, if incisions be made in inflamed parts of the filamentous tissue, which is not in the healthy state a very vascular substance, the vessels not only pour forth an unusual quantity of blood, often dark-coloured, but they seem to be much more distended, and also much more numerous than in the healthy state. It is this excessive accumulation and distension which produces the tendency to effusion, not only of lymph, but of blood and serum, and which appears to be not a mere hydraulic effect of retarded and impeded circulation, but to be the united result of hydraulic and physiological action. The vascular distension, therefore, must be regarded as, in the present state of knowledge, the first or initial circumstance in this process. Whether this is preceded by another preliminary state is not yet ascertained.

When inflammation, therefore, commences in a single spot of the filamentous tissue, and shows no tendency to spread, it is soon surrounded by lymph, which is effused from the neighbouring vessels. In some instances the inflammation subsides as this effusion, especially if mere serous fluid, takes place; and it may be removed, or disappear by absorption afterwards. If it do not terminate here, however, purulent matter is formed, and deposited within the enclosure of coagulable lymph; and this will find its way to the surface, by the process of progressive absorption and ulceration. It is in this state that the disease receives the name of *imposthume*, *abscess*, or *purulent collection*, (*apostema*; *abscessus*.)

"The *pus* of an abscess," says William Hunter, "cannot diffuse itself along the cellular membrane in the same manner

as extravasated blood or water ; because the ruptured cavity in which the *pus* is contained, is always encompassed by an inflammation, which hardens and unites all the fibres and *laminae* of the cellular membrane, and by that means renders it impermeable." (Med. Obser. et Inq. ii. xiii. p. 56.) This hardening and uniting inflammation is known to consist in the effusion of lymph, which unites the cells or spaces of the filamentous tissue, and thus prevents them from yielding, and the inflammation itself does not spread. "The cellular membrane, everywhere in the body," says John Hunter, "is united exactly in the same manner as the free surfaces of serous membranes, the sides of the cells throw out, or as it were sweat out, the uniting matter which fills the cavities, and unites the whole into one mass." (Part ii. Chap. iii. §. 14, p. 366 ; 400. new edit.) When we cut into inflamed parts after death, we find them firm and solid, resembling the section of a lemon, or some œdematous tumour, where we know extravasation has taken place. This appearance arises from the cells of the cellular membrane and other interstices of parts being loaded with extravasated coagulating lymph ; from this circumstance they are cemented together and become impervious to air, not similar in these respects to common cellular membrane or natural parts." (Part ii. Chap. iii. §. 6, p. 309. Vol. iii. p. 351, new edit.)

The delineation now given is correct as an anatomical history, in stating the ultimate effects recognized in parts which have been the seat of inflammation. But it is deficient in not tracing the early stages of the process, and distinguishing those phenomena which take place previous to the extravasation and coagulation of lymph. As this process is important in so far as it is quite similar to what takes place in the lungs and other organs, in which filamentous tissue forms either the basis, or a large proportion of their organization, I shall attempt to describe it shortly in this place.

1. The first perceptible circumstance in the process of inflammation in the filamentous tissue is an inordinate quantity of blood in the vessels of the part ; and this may either be the consequence of the general distension of the ordinary vessels, or, as some have imagined, the developement of new vessels. Probably, as it is known that the vessels which in the healthy state of most tissues are invisible, become distinct and large in the state of inflammation, it is unnecessary to admit the formation of new vessels. With this inordinate distension the blood,

in a portion of inflamed filamentous tissue, moves more slowly than usual, and at length in many parts remains altogether stationary. While this distension and retarded motion continue, the first effect is the extravasation of serum and of blood, with the *liquor sanguinis*, in the interstitial spaces of the tissue. The latter is always effused in the liquid form; and in some instances the first change is mere sero-sanguine fluid extravasated throughout the whole inflamed part. This effusion forms in several instances a species of natural termination and resolution of the inflammatory state. The sero-sanguine fluid thus effused is separated spontaneously into two parts, one coagulable, forming lymph, the other liquid, forming serum, and causing more or less *œdema* or anasarcaous infiltration in the part. The former remains in the situation in which it had been coagulated; and is the cause of the indurated state described by Hunter. It is always much less extensive than the part originally inflamed. The latter is often removed by absorption as the vessels begin to be emptied, and recover their natural calibre and properties.

2. In another class of cases, however, ulterior changes take place. While the general sero-sanguine extravasation and infiltration is present, and its separation into coagulable lymph and serous fluid is proceeding, either from the quantity effused being greater than can admit of this easy disposition of it, from the persistence and increase of the inflammatory injection and congestion, or from some other causes, it does not all separate into coagulable lymph and serum, but while part is separated into lymph, part also is converted into sero-albuminous or purulent fluid more or less perfect. In this conversion, different circumstances influencing the situation of the purulent matter are observed.

3. *a.* In some instances in which the inflammatory congestion is extensive, and the effusion of blood and sero-sanguine fluid sudden and copious, at certain parts the fluid effused may contain a larger proportion of coagulable matter than at others, and the tendency to limitation of the disease concurring with this, one part, in some instances two or three, become the seat of suppuration, which takes place within boundaries established by the matter effused becoming coagulated. The inflammatory action thus concentrated in particular points abates in intensity and extent elsewhere; and the result is one or more purulent collections contained within boundaries or walls

formed by the lymph which had been coagulated. This forms the *apostema per fluxum*, or abscess by fluxion of the old surgeons, in opposition to the *apostema per congestum* yet to be mentioned.

4. *b.* In another class of cases, in which the inflammation is still more extensive, and the effusion still more copious, the disposition to coagulation is so small, or it is so completely prevented by the quantity of sero-sanguine fluid extravasated, that no limitation takes place. When, in such circumstances, an incision is made into an inflamed mass of filamentous tissue, a considerable quantity of blood, generally dark-coloured, and of serum, escapes; but no lymph is observable, and no purulent matter is discharged. In the same part, however, it may happen that both lymph and purulent matter will be found twenty-four, thirty, or forty hours after the first incision.

5. *c.* In the latter case, it is not contained within distinct cavities bounded by circumscribed walls or deposits of lymph, but is found in cells of the filamentous tissue. It is then said to be infiltrated; and the tissue is said, in the vague language of modern times, to be infiltrated with purulent matter. This term might not be improper, if it did not lead by implication to the inference, that the purulent matter, ready prepared, was infiltrated into the cells or interstitial spaces of the filamentous tissue. That this is not the case, is evident from the fact already mentioned of the matter not being recognized at an early period of the inflammation, and appearing afterwards. It is quite clear that the process of suppuration is progressive; that at first, blood and bloody serum are extensively extravasated and infiltrated into the cells, and that there they undergo conversion into purulent matter, sometimes with small quantities of lymph.

6. The correct representation of the course of these processes, I think, may be given in the following manner. When the filamentous tissue becomes the seat of the inflammatory injection, congestion, and impeded circulation, and when these have proceeded to cause serous and sero-sanguine infiltration, at one part, or sometimes at two or three parts, a great and intense degree of the morbid action is concentrated; the part so affected becomes the seat of a more complete inaction; a sero-albuminous fluid is effused; and as this contains the elements of lymph and purulent matter, and becomes gradually separated into these two, the lymph is deposited on the margin of the inflamed part, while the purulent

matter is confined by the lymph within a cavity or cavities formed by its deposition. This greater intensity of inflammation is followed by an abatement of the disorder in the whole space originally affected ; and hence, I think, it is reasonable to conclude that, in cases of inflammation either of the filamentous tissue or of organs composed of that substance, the intensity of the inflammation is diminished and its destructive effects are counteracted by the destruction or sacrifice of one portion. The reason why the purulent matter is contained within the lymph is, that in the separation, the lymph adheres to the inflamed part, in order to stop the further extension or violence of the morbid process.

7. It further appears, that, in the process now mentioned, there is a perfect analogy between it and the process of inflammation and inflammatory secretions in the serous membranes. As in the serous membranes, the fluid, whether blood, bloody serum, or sero-albuminous fluid, is secreted at first in the liquid form. When the fluid secreted is not abundant, and when it contains a large proportion of albuminous matter, then separation into coagulable matter and serous fluid takes place quickly ; the former is allowed to remain in the parts or cells in which it was effused and coagulated, and agglutinates them more or less completely, while the latter, in consequence of its small quantity, is speedily absorbed. When the fluid secreted is more abundant, and its proportion of coagulable matter is less, coagulation is slower and less extensive ; and the albuminous portion being mixed with the serous, forms purulent matter more readily than either lymph or serum. In the third case, when the fluid secreted is very abundant, and contains still less coagulable matter, the process of separation into two portions scarcely takes place, or is altogether prevented from occurring, and the accompanying agglutination is also prevented. The first case is similar to the ordinary inflammation of the serous membranes, in which lymph is speedily formed, and the disease terminates in adhesion. The second case is similar to that in which adhesion is partial, and along with lymph there is some purulent matter. The third is the case in which adhesion is totally prevented by the immense quantity of serous and sero-purulent matter effused.

The state now described may be regarded as that of inflammation of the filamentous tissue, more or less acute, whether arising spontaneously, or without the operation of any manifest external cause, or in consequence of exposure to cold, the

effect of injury, violence, or contusion, or the result of wound excised, punctured, or lacerated.

There is, however, another form of inflammation of the filamentous tissue, of a more latent and insidious character, and much slower in progress, which, as often dependent chiefly, if not entirely, upon internal causes, urgently claims the attention of the medical pathologist.

In persons of peculiar constitutions, and under certain circumstances, it has been long observed, both by physicians and surgeons, that occasionally collections of matter, more or less intense, take place, preceded by little or no pain or heat, unattended with redness, and accompanied by so few feelings of uneasiness, that the formation of the tumour with fluctuation is the first proof of the existence of disorder. By the Arabians, and by the early physicians and surgeons, as Fallopius, De Vigo, Paré, Phioravant, Pigray, Hildanus, Marcus Aurelius Severinus, Saporta, Wiseman, Didier, and Reid, to these collections the name of cold abscess (*apostema frigidum*,) or abscess by congestion, was very generally applied, (*abscessus per decubitus*; *abscessus per congestum*,) principally because it was formed without the usual marks of acute inflammation; and the epithet is partly sanctioned by Bromfield, Lassus, Boyer, and other modern authors. It was a degree of error, doubtless, in the ancient pathologists to maintain the doctrine that collections of the kind now specified could be or were formed without inflammation, merely because the symptoms of pain, redness, and heat were either not present, or were not sufficiently intense to attract attention. It is further extraordinary that Mr Hunter did not recognize and rectify this error, and that he either imbibed the doctrine, that purulent collections of this nature were not a consequence of inflammation as much as those of more rapid progress, and that he gave it the sanction of his name and influence. In his fourth chapter on Suppurative Inflammation (section 4,) in which he treats of these collections, he not only admits that this kind of suppuration has none of the true characters of inflammation, and does not arise in consequence of common inflammation, but he allows that these collections are not inflammatory, and that they do not afford examples of genuine suppuration.*

* On the Blood and Inflammation, Part II. Chapter iv. §. 4, p. 419. New edition by Mr Palmer.

Though a few of the forms of suppuration to which Mr Hunter refers, for instance the mixed softening of pulmonary tubercles, which is a combination of softening and suppuration, may be of a character a little different from the rapid and acute suppuration already mentioned, yet none are so peculiar as to constitute a difference in kind. It must now be admitted as a fixed doctrine in pathology, that all these purulent collections are preceded by some variety of the inflammatory process, which, though differing in form from that already noticed, agrees with it nevertheless in the most essential characters.

The circumstance of absence of pain, even were this always the case, is not sufficient to warrant the inference that the collection is not preceded by inflammation, since I have already shown, that in pleurisy, pericardial and peritoneal inflammation, both lymph and purulent matter may be effused without much pain having been felt by the patient. In most cases, however, even of these purulent collections, precisely as we observe in pleurisy, pain is felt at some stage of the complaint, not acute or constant, but dull, gnawing, and recurring at intervals. The absence of redness is not extraordinary, as that is only observed when the inflammatory process is near the surface. In most instances of chronic abscess, the disease begins in the deep-seated cellular tissue. It may be doubted whether the statement, that heat is absent in this class of cases, is always well founded; for, in several cases of chronic inflammation in the cellular tissues, one of the most constant symptoms is unusual heat of the surface, and very generally a dry state of the skin.

The chief character of this form of inflammation of the filamentous tissue is, that it is latent and obscure in origin, at first mild in symptoms, but very obstinate, insidious, slow in progress, and very often difficult to be cured.

In certain instances, it is of a secondary character, that is, it depends on the inflammation of another tissue. Thus we see daily extensive suppurations take place in consequence of disease, generally chronic inflammation of bones, of periosteum, of lymphatic glands, and similar tissues.

To all these collections, whether primary or secondary, the general name of scrofulous and strumous has been applied; and they are said to occur principally in those of strumous diathesis, and to depend on causes which call this diathesis into action.

SEMIOGRAPHY.—The symptoms produced by inflammation

of the filamentous tissue vary according as the disease is acute or chronic, as the inflammation is extensive or limited, and as the effusion contains much or little coagulable matter.

In some instances acute phlegmon, if not extensive, is attended with little uneasiness. Slight transitory chills, the pulse accelerated to about 86 or 92 in the minute, heat and dryness of the skin, and some diminution in the quantity of the urinary secretion, are all the symptoms which can be recognized.

When the inflammation is extensive, as in cases of acute phlegmon from cold, contusion, wound or other injury, the pulse is more rapid, (120,) and full; the tongue is covered with a white or gray viscid coating, the skin is hot and dry, the urine is scanty, and the patient is restless and sleepless during the night.

When the inflammation is extensive, and the effused fluid contains little coagulable matter, the symptoms are still more serious. The pulse, at first quick and strong, becomes soon small and feeble; the white or gray fur on the tongue becomes dry, glassy, and brown; the thirst is intense; the memory is impaired, and the thought is confused; and the patient raves at intervals; while sleep is interrupted or accompanied with frightful dreams. As suppuration advances these symptoms are abated; but the pulse continues quick and small, and the tongue only gradually, and after some time, recovers its moist aspect, and at length parts with the viscid coating.

According as phlegmonic inflammation is seated in certain regions of the filamentous tissue, it is distinguished among practical authors and surgeons by particular names. When seated in the cellular membrane of the eyelid, it is termed sty, (*Hordeolum*); in that of the gum, Gum-boil, (*Parulis*); in that of the female breast, Mammary or Milk Abscess, (*Mastia*); in that of the prepuce, (*Phimosis*); in the pulp of the cellular membrane of the finger, a variety of whitlow, (*Paronychia cellularis*); and in that of the buttock, certain forms of inflammatory abscess or imposthume, (*Proctitis*; *Proctalgia*.)

B. The second form of inflammation occurring in the cellular tissue is when it spreads or is diffused along the membrane, or through its substance. John Hunter was aware of the tendency which inflammation, in certain circumstances, manifests to spread, and, referring it to a sympathetic disposition in the surrounding parts, suggests an illustration in the different qualities of dry or damp paper. "If dry," says he, "then

it will not spread, it will be confined to its point; but if damp, it will spread, being attracted by the surrounding damp, to which it has an affinity." (P. 264). Though this is a mere illustration, and is a statement of a physical, not a physiological phenomenon, it undoubtedly affords not an imperfect idea of the distinction between the limited or circumscribed, and the spreading or diffuse inflammation; and that Hunter was familiar with the distinction, appears from sundry parts of his desultory, though acute observations.

Two circumstances, however, appear to have perplexed not only his principles and views, but those of his contemporaries and successors. The first of these was the sense in which the terms *erysipelas* and *erysipelatous inflammation* were understood; the second the constant search for final causes or ultimate intentions. By most physicians and surgeons previous to the time of Carmichael Smyth and Willan, and even later, every spreading inflammation was denominated *erysipelatous*, whether it existed in skin, mucous membrane, serous membrane, or cellular tissue; and it was not the texture, but the nature of the morbid action that supplied the character of nomenclature. This practice, if not positively wrong, has the disadvantage of being attended with confusion in arrangement and description; and it is well that the general usage of correct pathologists has now restricted the term *erysipelas* to inflammation of a particular tissue.

The second source of perplexity in the reasonings of Hunter, speaking of adhesion in the limited inflammation, consists in regarding the effusion of lymph as a barrier against the diffusion of the morbid action. But Mr Hunter overlooked the fact, that in certain circumstances, as in the form of inflammation now considered, this barrier did not exist; and the morbid process therefore spread or extended. "We cannot," says he, "give a better illustration of the use of adhesions produced in consequence of this inflammation (the adhesive), than to contrast it with the *erysipelatous* (that is the spreading), of which I have already given an account. When the *erysipelatous* inflammation takes place, the matter gets very freely into the surrounding and sound cellular membrane, and then diffuses itself over almost the whole body; while, in another kind of constitution, the adhesive inflammation would have

been produced to have prevented its progress." (Part ii. Chap. iii. §. 14, p. 367, 4to. 401, new edit.) Here we have the erysipelatous inflammation occurring in the cellular membrane, and the adhesive mentioned as an agent of its prevention.

On another occasion, however, he is disposed to consider this as different from erysipelatous inflammation. "When it, (the erysipelatous) goes deeper than the skin, into the cellular membrane, it often suppurates; but then I suspect it is not the true erysipelatous; for in such cases it commonly produces mortification in the cells, by which air is let loose. This gives a strange feel, neither of fluctuation nor crepitation; and as there are no adhesions, the matter finds an easy passage into the common cellular membrane, increasing the same kind of suppuration wherever it comes; and as mortification is a consequence of those inflammations, putrefaction ensues, and the discharge becomes very offensive. When it produces suppuration in the cellular membrane it is often dangerous, both from the disease itself, and the consequences of the matter diffusing itself much farther. This effect frequently takes place when this inflammation attacks the buttocks or parts near the anus, and often proves fatal. Whether this difference in the effect of inflammation arises from the nature of the parts, I will not pretend to say. In such cases, as the sores seldom ulcerate, they should be opened early; for the matter either gets into the cellular membrane from the want of adhesions, or it separates parts that are only attached, as the periosteum from bones, muscles from muscles, &c. whereas the true suppurative ulcerates briskly, which, therefore, should not be opened early, but allowed to burst." (Part ii. Chap. ii. §. 7, pp. 271, 272. New edit. iii. 316, §. 7.)

It is better to regard it as quite different from *erysipelas*, which is now referred to the outer surface of the skin, and without ascribing it to the non-effusion of lymph, to say that it shows a tendency to spread, and thus prevents the effusion and adhesion.

Diffuse inflammation of the cellular membrane was early described by Bromfield (Vol. i. p. 94.) and Kirkland, (p. 282, Vol. ii.) afterwards by Willau, Thomson, and Copland Hutchinson, under the name of phlegmonoid *erysipelas*, noticed by various authors under the name of inflammation of the *fascia*, Kirkland (268,) and was described in 1823 by Dr Duncan Junior, under its proper denomination.

To the same head the swelled leg incident to childbed women has been by some referred. From an attentive consideration of the whole of the phenomena observable in this disease, Dr Hull inferred that the proximate cause consists in an inflammatory affection, producing suddenly a considerable effusion of serum and coagulating lymph from the exhalants into the cellular membrane of the limb; and he subsequently expresses his belief, that the seat of this inflammation is in the muscles, cellular membrane, and lower surface of the skin. (p. 204.) With regard to Hull's opinion of coagulating lymph being effused, it may be remarked, that whether it be lymph or not, it does not appear to deserve the name of *coagulating*; for it appears to produce neither adhesion nor limitation.

In this hypothesis, indeed, Hull was altogether mistaken. It is now ascertained that the swelling of the leg of puerperal females (*phlegmasia dolens*) is altogether a secondary result of obstructed venous circulation. It consists in simple effusion of sero-albuminous fluid into the filamentous tissue, in consequence of the impeded motion of the blood through the venous canals, obstructed either by pressure, or by the presence of clots of blood within the canals, or lymph or purulent matter in consequence of inflammation.

The anatomico-pathological characters of diffuse inflammation I have already shortly given, so far as they can be referred to the filamentous tissue. Though I do not deny that this inflammation does take place in this tissue, I am satisfied that many cases which have been referred to the head of diffuse or disjunctive inflammation of the filamentous tissue, were in truth instances of inflammation in another tissue, namely, the adipose membrane, which, though in some respects allied to the filamentous, and by many confounded with it, is nevertheless distinguished by a considerable number of important circumstances. On this account I shall consider the Disease named Diffuse Inflammation under the subsequent section.

§. II. *Pimelitis*. Inflammation of the Adipose Tissue. Inflammation of the *Membrana Adiposa*.

Marcelli Malpighi, Exercitatio de Omento, Pinguedine et Adiposis Ductibus. Apud Opera Omnia Londini, 1686.—Frederici Hulsebusch de Fabrica Panniculi Adiposi, sive Membranæ Cellulosæ, ejusque et contenti olei Historia, usu, Morbis. Apud Francisci Jos. de Overkamp, Collectionem Dissertationum Inaug. Lug. Bat., Tom. i. Francofurti ad Moenum, 1767.—Case of Inflammation and subse-

quent Mortification of the Adipose Membrane surrounding both kidneys ; with the Appearances on Dissection, by Thomas Turner, M. D., &c. 12th Nov. 1812.—Transactions of Royal College of Physicians, Vol. iv. p. 226. London, 1813.—Remarks on Irritative Fever, commonly called Plymouth Dock-Yard Disease, with Mr Dryden's account of the Fatal Cases, by John Butter, M. D., F. R. S., &c. Devonport, 1825. Pp. 302.—An Inquiry concerning that disturbed state of the Vital Functions, usually denominated Constitutional Irritation, by Benjamin Travers, F. R. S., &c. London, 1826. 8vo, pp. 556.—Case of Inflammation of the Adipose Tissue, forming the Sheath of the Carotid Artery, followed by erosion and perforation of the Arterial Tissue and Fatal Hemorrhage ; and some Remarks on the Peculiarities of Inflammation of the Adipose Tissue, by David Craigie, M. D., &c. Edin. Med. and Surgical Journal, Vol. xlviii. p. 396. Edin. 1837.—Report of Consecutive Cases of Erysipelas, and of Diffuse Inflammation of the Cellular Tissue. The latter from the absorption of animal poisons occurring in the Hospital Practice of the 79th Regiment, at Glasgow, in March and April 1837, by D. Maclachlan, M. D., Assistant-Surgeon 99th Regiment. Edin. Med. and Surgical Journal, Vol. xlviii. p. 352. Edin. 1837.

The Adipose Membrane is one of the most extensively distributed tissues in the animal body ; and this circumstance, with its peculiar organic and physiological properties, exercises remarkable influence on its inflammatory and other morbid states.

In distribution it may be distinguished in the following manner. 1. The subcutaneous adipose tissue, extended in a uniform layer, variable in thickness, beneath the skin all over the body, excepting at certain parts where the skin communicates with the mucous membrane, as the eyelids, the lips, the penis of the male, the *labia* in the female, where there is no adipose tissue, and beneath the hairy scalp, where the adipose tissue is extremely thin ; 2. the periangular adipose tissue, surrounding and enclosing the large blood-vessels and nerves in the trunk and extremities, forming a sort of sheath to these organs, and sustaining their nutrient vessels, (*vasa vasorum*) ; 3. the sub-serous adipose tissue deposited, more or less abundantly, beneath the different serous membranes, and between their folds, often round blood-vessels, for instance between the pericardium and muscular substance of the heart, between the peritoneal folds, forming the *omentum* and the mesentery ; 4. round each kidney ; 5. between the folds of the synovial membranes ; and, 6. the endosteal or intra-osseous, or the medullary membrane within the canals of the longitudinal bones and the cells of the flat and short bones.

In all these situations it may, as to structure, be distinguish-

ed into two elements, one organic and secreting, the other inorganic and secreted. The former consists of a species of filamentous tissue, formed into spheroidal and ovoidal bags or vesicles, without opening, and without communication with each other. The latter is the adipose matter which is deposited in their interior, and which is altogether void of vital properties. These circumstances it is of the utmost importance to bear in mind, in considering the adipose membrane in the state of inflammation, and other morbid processes.

The physical properties which arise from this form of structure, and the physiological relations of the adipose membrane, combined with its anatomical position, possess considerable influence over its morbid states.

In the *first* place, as the adipose membrane consists of two parts, organic or vital tissue, and an inorganic secreted substance, and as the former bears a small proportion to the latter, the vital properties of the tissue are accordingly much less prominent than the mere physical properties. The component *sacculi*, or vesicles of the adipose membrane, are not possessed of highly or strongly marked vital powers; and the vessels distributed to them, which are neither large nor numerous, seem to be merely adequate to their nutrition in ordinary circumstances, but quite unable to maintain the energies of the tissue when subjected to disease or injury. Pressure or stretching the adipose tissue bears very imperfectly; and when it is subjected to violence or injury of this kind along with other tissues, as skin, muscle, cellular membrane, or artery, its vitality is destroyed first, and long before these tissues are much affected. In continued fever (*synochus*; *typhus*,) the adipose membrane of the sacral region is often killed to a large extent long before the skin is affected; and its death involves necessarily ulceration of the incumbent skin, in order to allow the escape of the dead adipose membrane in the form of a large flat slough. It is perhaps of no great moment whether this imperfect and feeble vital energy depends on the want of nerves, or on the small number and size of its nutrient vessels. The fact of feeble vitality is well established by many circumstances of daily occurrence, and is further illustrated, as shall be seen, by the different appearance and effects of the phenomena of inflammation in tissues more completely organized, and endowed also with more active vital properties.

In the *second* place, as to anatomical position, the adipose tissue is in many situations of the human body so closely confined, that when inflamed, and consequently distended, it cannot easily expand. This is particularly the case, not only with the subcutaneous fat which is compressed by the skin, but with the dense adipose cushion surrounding the blood-vessels and nerves, which, in the extremities at least, and in the neck, is closely packed and compressed, as it were, by all the incumbent and surrounding tissues,—muscles, fascia, and skin. When we examine the adipose cushion surrounding the carotid artery in the neck, that accompanying the axillary and brachial artery in the arm-pit and arm, and that enclosing the femoral and popliteal arteries in the leg, it must appear obvious, that little or no space is left in either of these regions for the casual expansion of the adipose membrane, from whatever cause proceeding. Not only is the adipose cushion there closely confined by condensed filamentous tissue; but it is further inclosed and compressed by the incumbent *fasciae*, muscles, subcutaneous adipose membrane, and skin; and the degree of tightness may be estimated from the fact, that even when cut into in the healthy state, it is forthwith protruded, and is with difficulty replaced. This tightness is one great cause of the readiness and celerity with which the adipose tissue in this situation passes so readily into mortification. As it is distended by the inflammatory vascular congestion, and as the surrounding parts do not yield with proportional facility, it is as if inclosed within a long tight ligature, and is in a manner strangled by its own enlargement. This result is clearly illustrated by the effects of inflammation of the periangular adipose membrane.

In the *third* place, the inflammatory states of the adipose membrane are not only in themselves of the highest importance, from the anatomical and physiological properties of the tissue itself, but in consequence of the uses to which this tissue is applied in enclosing and supporting others, and especially the nutrient vessels of blood-vessels, nerves, tendons, and bones, these states may exercise on the economy a most important influence, which I believe has not hitherto been fully understood.

Inflammation attacking the subcutaneous adipose tissue is liable to produce death, not only in that membrane but in the skin, inflammation and death in the muscles, inflammation in

the subcutaneous veins, and inflammation and death in the tendons.

Inflammation attacking the periangular adipose tissue is liable to be followed not only by death in that tissue itself, but by inflammation, death, and ulceration of the arterial tunics, and consequent hemorrhage, inflammation of the veins, with obliteration of their canal, and denudation of the nerves.

Inflammation attacking the medullary or endosteal adipose tissue produces suppuration and causes death in the bone, (*Necrosis*,) and in the cancellated tissue the phenomena of the disease named *Spina ventosa*.

When inflammation affects the adipose membrane it may assume either the limited or the diffuse form, but is most frequently perhaps seen in the latter state.

It appears to have been an opinion entertained by Boerhaave and several of his pupils, that phlegmon, or common acute circumscribed inflammation, is seated in the adipose membrane; and one of these writers, Hulsebusch, announces this proposition formally in a dissertation. The same doctrine was afterwards taught in this country by Bromfield, who allowed that the adipose membrane is quite distinct from the filamentous tissue,* and further believed, that extravasated fluid would sooner be converted into purulent matter when lodged in the adipose than in the cellular membrane. It is further remarkable that,

* "I may be singular in what I am going to advance, viz. that in general the *adipose* membrane is the seat of abscesses, especially those that are circumscribed.

"I hope I am understood, that I suppose what is generally defined a *phlegmon* or critical abscess, in which a large quantity of matter is collected, to be formed in the *membrana adiposa*." In the following passage he gives the first description of diffuse inflammation. "Nevertheless I am extremely sensible, that the cellular or connecting membrane is frequently the seat of mischief, as the receptacle of some extravasated humour, where the fluids in general have a tendency to sphacelation; and under such circumstances it is well known, that the humour, instead of being collected and forming an abscess, will be diffused proportionate to the quantity extravasated, and form sloughs, throughout a whole limb, and where probably, the external appearance of sphacelation shall not exceed the size of a crown-piece, the mortification will then discover itself soon after, at a small distance; and we shall find in the end, that it has not only crept under the skin, but has burrowed deep between the muscles, and through some of these sphacelated parts, sloughs of an immense length are frequently drawn out, which prove to be the cellular membrane; in which case, if the patient does not sink under the discharge, the neighbouring parts must, in healing, unavoidably unite, and consequently the limb be abridged of its motion, as far as the free motion of the muscles, one over the other, is hardened by this union."—*Chirurgical Observations*, Vol. i. chapter iii. p. 94 and 95.

while he gives the earliest good description of the phenomena and effects of diffuse or disjunctive inflammation, he refers the seat of circumscribed inflammation to the adipose membrane, and that of disjunctive inflammation to the cellular membrane. The converse of this notion was maintained by J. Hunter, who represents the cellular membrane free from the adipose, to be more susceptible of the adhesive inflammation than the adipose membrane, and much more readily to pass into the suppurative.* This, however, he afterwards in some manner controverts by giving the same view of the effects of cellular inflammation, as that previously furnished by Bromfield.

All that it appears to me can be concluded at present on this subject is, that, though inflammation with tendency to circumscription may attack the adipose tissue, yet that tissue is much more liable to assume the diffuse, spreading, and disjunctive form of the disease.

In my *Elements of Pathological Anatomy*, published in 1828, I was led from various facts to form the opinion, that the peculiar disease described as *Diffuse Inflammation of the Cellular Membrane*, is indeed inflammation of the *Adipose Tissue*, as quite distinct from the *Filamentous*, principally because that disease takes place chiefly in those regions in which the adipose tissue is most abundant,—for instance in the neck, in the chest between the two pectoral muscles, in the arm-pits, in the extremities immediately beneath the skin, and in the buttock at the verge of the anus.† The correctness of this opinion I had soon frequent occasion, both in the course of private and hospital practice, to see amply and satisfactorily confirmed; and

* “The cellular membrane, free from the adipose, appears to be more susceptible of the adhesive inflammation than the adipose membrane, and much more readily passes into the suppurative. Whether this arises from surfaces inflaming more readily than other parts, I will not pretend to say. Thus we see that the cellular membrane connecting parts together as muscles, and the cellular membrane connecting the adipose to muscles, easily inflames, and runs readily into supuration, and as it were separates the muscles from their lateral connexion, and even separates the adipose from the muscles, while the skin and adipose membrane shall only be highly inflamed; and the matter so formed must produce ulceration through all this adipose membrane to get to the skin, and then through the skin, in which last-mentioned parts it is much more tedious.” (P. 234. iii. 282, P. ii. Ch. ii. § 3.) Hunter appears in this place to have confounded the two kinds of inflammation, the adhesive or limited, and diffuse or suppurating.

† *Elements of General and Pathological Anatomy*, p. 36 and p. 62.

I have elsewhere* adduced the leading facts and arguments, which, according to my own views, tend to establish this as a principle in morbid anatomy and pathology.

Among the proofs adduced in favour of this view, I have there mentioned the following. "In cases of diffuse inflammation affecting the arm, the inflammation spreads along the adipose membrane, producing sero-purulent secretion and sloughs of the adipose tissue. In cases of inflammation at the verge of the anus, the disease spreads in the same manner, and affects almost exclusively the adipose tissue round the anus and rectum, and along the *glutaei* muscles. It is in the same manner that the adipose cushion with which the blood-vessels are surrounded is occasionally the seat of a species of bad inflammatory action, terminating in fetid and sloughing suppuration."

I have several times, I may say often, observed inflammation of the adipose tissue, presenting the external signs described by my late friend, Dr Duncan Junior, as those of diffuse inflammation of the cellular membrane, produce all the effects now specified, and, by the peculiar manner in which the inflammatory process spreads along the meshes of the tissue, detach extensively the skin from the muscles, and the muscles and *fasciae* from each other, and, in consequence of the intricate manner in which it insinuates itself between the muscles and their *fasciculi*, produce extensive disjunctive destruction of the different parts which it affected. Thus, on the side of the chest, I have seen it first disjoin, and then kill the fibres of the intercostal muscles, and, affecting the *pleura costalis* at its muscular surface, pass to the free surface, and give rise to pleurisy and *empyema*. In the buttock, at the margin of the anus, I have seen it detach the skin completely from the subjacent muscles, dissect round the *sphincter* and *levator ani* as completely as if done by the knife, and produce such disjunction and separation as to render the whole of the muscles completely useless as organs of motion.

In the course of these destructive processes, this disease, which, though first confined with extreme accuracy to the adipose tissue, eventually affects muscles, tendons, blood-vessels, and nerves, by killing and detaching that texture which supports and encloses them, and conveys their nutrient blood-ves-

* The Anatomy and Pathology of the Adipose Tissue, in the Cyclopædia of Anatomy and Physiology.

sels, is ever attended with febrile symptoms, remarkable for their character in deranging all the functions, and impairing more or less, sometimes very considerably, the muscular strength. The pulse is rapid, but generally much oppressed, and though sometimes at the commencement sharp, is generally contracted, wiry, and even vermicular. The skin is pungently hot and dry; the tongue more or less furred, with much thirst; and in severe cases, where the disease assumes a violent character, the patient raves or mutters, and sometimes passes into a state of *typhomania* (*coma vigil*), or even afterwards coma. The complexion is often of a dingy colour, as it is in typhous fever, or in cases of traumatic gangrene, or in cases of death by animal poisoning; and the eyes, though they may be free from injection, are generally suffused, watery, and turbid. At the same time, almost all the great secretions are more or less completely suspended, or as it were locked up, by the perverted and diminished action of the capillary vessels. The skin is dry and imperspirable, and only at the termination of the disorder betrays the existence of clammy moisture. The urine is scanty and clear till the close, when it becomes sedimentous. No cathartic medicines, however powerful, can produce feculent discharges from the intestines, and all that escapes is a watery secretion with minute black specks, grains, and patches of undecomposed bile, without the characteristic feculent odour or aspect.

The peculiar characters of this form of fever have procured for it, from Dr Butter* the name of Irritative, and from Mr Travers,† that of Constitutional Irritation; denominations which may be perfectly correct, if they either denoted a new form of general disorder, or established as a new principle in pathology, the circumstance, that when any individual texture is in a morbid state, it gives rise to derangement, perversion, and irregularity, in the motions of the sanguiferous system and the dependent secretions. It appears to me that there is in this nothing new nor even singular, when we know, that it is an established principle in physiology and pathology, that all the textures of the animal body are so allied, that one cannot be long in an

* Remarks on Irritative Fever. By John Butter, M. D., F. R. S., &c. Devonport, 1825, 8vo, pp. 302.

† An Inquiry concerning Constitutional Irritation. By Benjamin Travers, F.R. S. London, 1826, 8vo, pp. 556.

unhealthy state without inducing general disorder, and that all the properties and actions of these textures are so intimately associated, that those of one organ are almost never impaired or perverted, without betraying the existence of this impairment or perversion, by disorder in the motions and actions of the sanguiferous system, and, its great dependent, the secreting apparatus of the different organs.

The disease, however, is not in all cases a simple and exclusive affection of one tissue; and the singular feature of this inflammation is, that, either simultaneously or successively, it affects a considerable number of different tissues. It hence results that the concomitant symptoms are by no means uniform, and assume various types according to the tissues affected.

Thus, in inflammation of the adipose tissue, the disease is very liable to attack the filamentous tissue, which it disjoins and destroys in the manner already described. It also very commonly attacks the veins; and the symptoms are then complicated with those of venous inflammation; and may eventually give rise to the secondary suppurations observed to ensue on that disorder. The venous tunics are then observed to be thickened, and sometimes adhering, with obliteration of the canal; and in several instances matter, or lymph, or both are found within the veins. Lastly, it may produce denudation of the arteries exactly as a broad ligature, or any foreign substance in the neighbourhood of, or around the arterial tubes, and in this manner induce erosion, and rupture of the artery with fatal hemorrhage.

In ordinary circumstances, the course of phenomena appears to be nearly the following. Sometimes without previous warning, in other instances after slight sensations of chilliness and languor, or even after distinct shivering, heavy dull pain is felt in one part particularly, as the neck, the breast, or an extremity, according to the situation which the disease affects. This painful sensation spreads or extends, amounting to stiff soreness of the whole region, with more or less tenderness of the integuments. If the part is examined, it is found affected with diffuse or extensive swelling, compressible, but not very elastic, considerable tension of the skin, great heat, and in some instances a dull red tinge. In some instances the skin retains its natural colour,—a circumstance which is to be ascribed to the depth of the inflammatory action, and perhaps the early period of the

disease. In some it is of a faint red, inclining to yellow or orange, which becomes more distinct when pressure is applied; and in some the disease passes through every stage without even producing redness of the skin. In others long red patches, of no determinate shape, may be remarked; but this appearance is more common when the superficial adipose tissue is affected, and when the disease is verging to suppuration. These symptoms, which may be considered as indicating the first or inflammatory stage, last from thirty hours to three or four days,—seventy-two, eighty, or ninety-six hours.

As they proceed, the swelling increases, and may become more prominent at one part than another, but still retains its diffuse and shapeless character. The pain, which is continual, becomes occasionally more acute, and is attended with an insufferable sensation of oppressive weight. If the disease affect an extremity, the patient feels as much difficulty in raising it as if it were a dead mass, or unconnected with his person. At length, about the fifth, sixth, or seventh day, according to the rapidity of the disease, the swelling presents in sundry parts a peculiar compressible, but not very elastic character, as if the subjacent tissues were floating in some fluid or semifluid matter.

At this period the constitutional symptoms, which consist in quick sharp pulse, great heat, thirst, loss of appetite, languor, and sometimes delirium, assume the appearance of extreme oppression and mortal weakness. The pulse becomes much quicker, small and fluttering, sometimes intermittent; the tongue, which had previously been covered with a thick, gray, or yellow, moist, viscid fur, or was red and glossy, is covered with a rough fur, dry, brown and hard, yet the patient is insensible of thirst. The skin is dry, or partially moistened with cold unctuous sweats; the urine is scanty and high-coloured, sometimes entirely suppressed, or passes with the stools involuntarily; low muttering alternates with stupor; the breathing becomes quick, panting, and laborious, or slow, languid, and interrupted, and terminates in death.

If the affected part or limb be examined after death, the whole sub-cutaneous adipose tissue, and the intermuscular cellular tissue, are found enlarged, gray, or ash-coloured, and distended with blood-coloured fluid, oily serum, or sero-purulent, or purulent matter. It is detached, in general, extensively from the several organs which it connects in the healthy state. Between the

muscles, which are dark-coloured, softened, lacerable, and emit a fetid odour, are found long sinuous caverns filled with dirty ash-coloured purulent fluid; sloughs or mortified shreds are seen here and there hanging from aponeurotic sheaths, tendons, or even blood-vessels; and while in most cases shreds or filaments of the subcutaneous adipose and the cellular tissue are the only traces of its existence, in not a few instances the muscles are detached from the periosteum, and the *periosteum* from the bone. These shreds or filaments are mortified pieces or sloughs of adipose membrane and cellular tissue, and correspond to the pieces of wet tow mentioned by Hunter and Sir E. Home, and the wads of wet shamoy leather noticed by Mr James.

This may be regarded as the most exquisite or severe form of the disease. Its duration in such circumstances varies. It appears from the result of Dr Duncan's observations, that death does not take place before the sixth day, but may occur in any subsequent one to the twelfth or fifteenth. Perhaps in the average number of cases the seventh, eighth, or ninth may be stated as the day on which the termination occurs.

In milder cases it may terminate in resolution. The general swelling subsides slowly, the pain disappears, the skin becomes cool; and the constitutional symptoms decline upon the eruption of a copious sweat, a cutaneous disease or other critical action.

It may terminate in abscess. The inflammatory action changes its character, and, instead of spreading, shows a disposition to stop. Lymph is effused, healthy purulent matter is formed, and adhesion taking place in one or more points, the disease terminates in phlegmonic suppuration.

In some instances the spreading and limited may be combined. The spreading or diffuse inflammation proceeds at one part of the affected tissue, while the limited with lymph effusion and adhesion appears at another. This appears to be the fact in those tedious cases in which the disease is prolonged for weeks, and the patient either recovers, or ultimately dies hectic.

When recovery takes place after suppuration and sloughing of the adipose and cellular tissue, it is effected partly by direct adhesion taking place between the muscles or their cellular substance, and the skin, partly by the formation of new cellular tissue similar to those new membranes which are formed in the serous surfaces. The former is the cause of the stiffness, immobility, and condensation of parts after this inflammation has taken place.

The causes of this disease are not well known. There is reason to believe that it requires for its production a peculiar state of the constitution; for it more readily attacks the bloated and those of broken constitutions than the spare and the vigorous; it is more common and more severe in the corpulent and plethoric than in those of healthy and active habits; it is more common in those liable to mental inquietude and peevishness than to those of equable or indifferent temperament; and the same exciting cause which produces in a young and healthy subject a common phlegmonic abscess, will be followed in a sallow middle-aged person, of dry or unctuous skin, with a fatal inflammation of the diffuse character. Something also appears to be attributable to epidemic influence; for several cases are generally remarked to occur much about the same time; and it has been further remarked, that when rose, scarlet fever, and bad sore-throat prevail, instances of diffuse inflammation are not unfrequent.

With regard to agents which appear to possess exciting power, it may occur spontaneously; but has been observed to succeed the following circumstances; venesection and punctured wounds in general, application of a ligature to a vein, puncture by a cutting instrument during dissection, inoculation by morbid secretions from living animals, the bite of a venomous serpent, acrid or poisonous substances of the acrid family applied directly to the skin or adipose membrane, sprains or injuries of the fibrous tissues, and contused or lacerated wounds.

Though this disease may arise both spontaneously, and also in consequence of lacerated or punctured wounds, or even mere scratches or abrasions, and in consequence of various poisonous substances applied to the skin or the adipose membrane, it appears further, in certain circumstances, to ensue on the application to the skin of various acrid and irritant poisons. Thus, in the experiments of Orfila upon the mode of operation of these poisons, it was a frequent occurrence to observe diffuse inflammation in the adipose tissue ensue on the application of such substances as bryony-root, elaterium, colocynth, gamboge, spurge-flax, euphorbium, &c. to the skin or the adipose membrane exposed by wound. Dr Duncan relates a case communicated by Dr Spens, in which it followed the application of an ammoniacal plaster for the removal of rheumatic pains. I must also, at the same time, refer to what I have already said under the head of Malignant Pustule, for some remarks on the connection be-

tween that disease and the one now under consideration. (See Vol. i. p. 656.)

Diffuse inflammation may occur in any part of the adipose membrane of the whole body, and may affect either the sub-cutaneous or superficial, or the inter-muscular or deep cellular layer. But the regions in which it is most commonly observed may be enumerated in the following order :—

a. The neck. (Kirkland, Vol. ii. p. 158. Case by Wells in Transactions of a Society, Vol. iii. p. 360, and by Wilson, 367. James, p. 187, &c.)

Angina externa of Kirkland and James. In persons, generally females, of full, gross habit, and bloated appearance, swelling diffuse appears deep-seated in the side of the neck, towards the angle of the jaw, causing much pain in that side of the head, attended with much fever, general disorder, loss of appetite, raving, stupor, and coma. It terminates in sloughs of the adipose membrane, foul ill-conditioned purulent matter, does not point, but may burst internally and cause suffocation.

b. The breast or outer surface of the chest and arm-pit. Abscess in the axilla of Kirkland, &c.—Several cases in the Essay of Dr Duncan.

Diffuse swelling, very painful, of the side, occurring in middle-aged subjects, male or female, terminating in suppuration all over the side, or between the pectoral muscles, or into the arm-pit.

c. The Buttock, *Proctia*. Phyma of the Ancients. *Proctitis*, *Proctalgia*, and *Chunesia* of the nosologists. *Suppuration gangreneuse* of the French. Described by Pott in his second section on *Fistula Ani*, p. 49.—Case given by Hunter in his third chapter, section xiv. on the Use of the Adhesive Inflammation.—Abscess *juxta anum* of Mr James, at p. 189.

In persons of gross bloated habits, either naturally or rendered so by gluttony and intemperance, hard, diffuse swelling takes place at the verge of the anus on each side, with the skin doughy and inelastic, sometimes colourless, generally of a dusky red or purplish colour, with sickness, vomiting, shivering, great restlessness, heat, and thirst, pulse at first hard, quick, full and jarring, afterwards weak, fluttering, or irregular, with brown tongue, and mental disorder. After three, four, or five days, a small quantity of bad ill-conditioned matter and sloughs of the adipose and cellular membrane are formed. This inflammation may spread along the urethral and scrotal cellular tissue, and thus form the

urethral abscess (*juxta urethram*) of Mr James. Of this an instructive example is related by John Hunter at the passage above referred to. This disease is distinguished according to him by the combination of the suppuration with the erysipelatous (spreading) inflammation. It is not so circumscribed as the former, nor does it spread on the skin like the latter; but the skin is shining and œdematous, and the inflammation goes deep into the adipose substance, and forms dusky-coloured, fetid, purulent fluid, sometimes with air, in a bag or abscess without previous adhesion. The inflammation and matter may pass downward and forward into the scrotum and beside the urethra, and upwards by the adipose tissue of the belly and loins; and when openings are made either artificially or by the process of ulceration, matter is discharged, and the adipose membrane mortified hangs out like wet dirty tow. (Hunter, p. 368, 401, new ed.) This disease is attended with typhoid symptoms, and terminates fatally. Yet, notwithstanding this extensive destruction both of adipose substance and even of skin, it is remarkable that the rectum generally escapes. “If an inflammation attacks the cellular membrane on the outside of the gut near the anus, although the gut is in contact with the inflamed part, yet the inflammation extends to the skin of the buttock, while the gut remains pretty free from inflammation.” (P. 236, 285, new ed.)

d. The extremities, after punctured wounds with foul instruments or in the course of dissection, or bites of poisonous animals, or morbid secretions applied in any manner to the exposed corion. The characters of this form are easily understood from the general description already given in Dr Duncan’s cases.

To the same head the phlegmonoid erysipelas, described by Mr A. C. Hutchinson, in the legs of seamen is to be referred. (See Thomson’s Lectures on Inflammation, p. 512, 513.)

The account of the necroscopic appearances, however, above given, is applicable principally to the disease as it takes place in the subcutaneous adipose tissue; and perhaps, as it spreads to the intermuscular filamentous tissue. These appearances, though in all general characters similar in other tissues, are varied according to the portion of adipose membrane attacked.

The disease may either, when originally commencing in the subcutaneous adipose tissue, spread to the periangial, or it may

commence in the latter at once, and produce destructive ravages in the periangular sheath, and most pernicious effects on the blood-vessels. Thus, I have elsewhere recorded the principal circumstances of a case in which the disease attacked the periangular adipose tissue of the right carotid artery and jugular vein, destroyed the sheath of the space of eight inches, denuded and exposed both vessels, produced gangrene and erosion of the artery and inflammation of the jugular vein, with obliteration of its canal, and denudation of the trunk of the pneumogastric nerve. (Edin. Med. and Surgical Journal, Vol. xlviii. p. 396.)

The adipose tissue connected with the internal organs is also liable to be attacked by inflammation. That enclosing the kidneys in particular has been found affected with, and destroyed by, the true disjunctive inflammation. One of the most characteristic examples of this disease on record is given by Dr Thomas Turner, in the fourth volume of the Medical Transactions of the Royal College of Physicians. In this case the disease commenced with sickness, vomiting, and pain in the bowels, followed by pain in the back and loins; and at the end of about thirty-eight hours with great restlessness, anxiety, laborious, panting respiration, and loss of pulse at the wrist. Death took place at the end of forty-eight hours. The whole adipose tissue enclosing the kidneys was in a gangrenous state, exhibiting a large mass of black pulpy matter. The capsules of both kidneys were inflamed, that of the right kidney mortified, and slight traces of inflammation were observed in the internal structure of both kidneys. In the winter of 1816-17, I examined the body of a man in whom I found the whole of the adipose cushion surrounding the left kidney, converted into an ash-coloured fetid, semifluid pulp, similar to a mixture of train oil and jelly, mingled with shreddy filaments, and in which this suppurative sloughing process had opened a passage from the fat of the left kidney into the interior of the transverse arch of the colon. In this case, though the patient did not complain of much pain, and presented chiefly the general langour, oppression, and stupor observed in typhoid fever, the pulse was quick and small, the tongue brown and dry, the thirst intense, afterwards not felt, the countenance dingy and lurid, and the eyes heavy, the bowels difficult to be affected by medicine, the urine scanty and high-coloured, and at length suppressed; and the

patient, after muttering delirium and *typhomania* on the second day of the attack, with *subsultus tendinum*, passed into a comatose state, which terminated on the fourth day in death.

The endosteal or intra-osseous adipose tissue, in other words, the medullary membrane, is liable in like manner to both forms of inflammation, but especially the suppurative and disjunctive; and the invariable effect of this is to kill the compact tissue of the bone, and produce atomical death or caries of the cancellated tissue. *Necrosis* is the result of the former, and *spina ventosa* and caries of the latter. The full consideration of this variety of the disease, however, belongs to the province of surgical pathology.

I have now described the usual characters of this disease in its most acute, intense, and rapid form. But it sometimes happens that it is slower in progress and less intense in severity; and in this case it may be said to be subacute or chronic. Thus I have seen an instance in which the disease attacked the adipose tissue of the arm, and though attended with well-marked fever, yet without the overpowering symptoms of prostration so often observed,—and advancing so slowly as to admit of the employment of local depletion by leeches, and the effect of antimonials and purgatives, so as eventually to terminate in resolution.

The foregoing account may communicate some idea of the seat of this disease, of its effects and of its dangerous tendency. I have yet to offer a few remarks on its nature, its pathological peculiarities, and the causes on which its developement may seem to depend. Some of these points I have indeed anticipated. But others are entitled to more systematic examination.

The most remarkable circumstance in the pathological history of *Pimelitis*, is the extreme rapidity with which it generally proceeds to sero-purulent infiltration and disjunctive destruction. In several cases this has been known to take place within thirty-six hours from the appearance of the first symptoms of uneasiness. In others, it occurs in the course of about seventy-two hours; and in very few cases is this event protracted beyond the fourth day.

Very nearly at the same rate may be estimated the fatality of the disease. Wherever the inflammation is very extensive, and especially if it occur in middle-aged or elderly corpulent persons, death is very likely to ensue in the course of the

third, or at most, the fourth day. In young and robust persons, on the contrary, and in whom the adipose tissue is not much loaded, the disease is slower in progress, and less frequently fatal in termination. The most rapidly fatal case which I think I have yet witnessed occurred in a male patient in the Royal Infirmary this season. He had been under treatment for slight diarrhœa, which disappeared under the use of chalk mixture and opiates, alternated with gentle eccoprotics, and the use of nutritious diet, and for several days expressed himself well. He was in his usual health at the visit preceding the last day of his life; but in the afternoon, about four, he was attacked with pain of the left thigh and iliac region, which speedily became swelled, hot, red, and livid, and presented a large detachment of the cuticle, containing livid serum (*phlyctæna*). Next day the features were decomposed, the face pale, the countenance Hippocratic; and death took place the same evening, within twenty-six hours from the first appearance of symptoms. Upon inspection, the whole adipose membrane was found extensively infiltrated with dirty oily-like serum. The arteries were not diseased.

ANATOMICO-PATHOLOGICAL CAUSES OF DISJUNCTIVE INFLAMMATION.—Though I do not deny that this disease is occasionally to be seen in the filamentous tissue, yet I think this is a much rarer occurrence than in the adipose membrane; and several circumstances appear to prove, that it is, if not the only, at least by far the most common, form of inflammation in that tissue. This conclusion is founded not only on the anatomical fact of the adipose membrane being found most usually the seat of the disease, and of its affecting parts where this texture is most abundant, as already stated, but also in another circumstance, viz. that the disease is most frequent in corpulent persons, in whom the adipose tissue is abundant. This circumstance again seems to be referable to the low vital energy of that tissue, as already in some degree explained.

In the corpulent, either by habit or age, in whom this disease assumes its most exquisite, intense, and unmanageable forms,—who are generally not only plethoric, but bloated, and liable to imperfect circulation, and disorders of the circulation and secretion generally,—and in whom slight causes are often followed by serious disorders, the adipose tissue appears to lose a great proportion of the small degree of vital energy

which it possesses, and the more abundant the secreted product is, the less active are its vessels and the inherent properties of the membrane. In consequence of this greatly impaired energy, slight causes, as cold, scratches, or abrasions, punctures, contusions, &c. are suddenly followed by a more or less complete loss of circulation and action in the tissue; for the disease consists not in increased, but diminished action; and this impaired energy continues until the natural functions of the tissue become extinct. In these circumstances, with few and inert blood-vessels, the secreted or inorganic matter of the adipose tissue becomes as it were a cause of strangulation of the tissue itself, or at least tends so directly to suppress the energies of its organic part, that it is incapable of resisting the influence of morbid agents of ordinary power; and hence, the organic either may be smitten with immediate death, or is easily made to assume a very low, languid, and imperfect form of morbid action, which speedily terminates in death.

This low degree of vital energy seems the principal if not the sole cause of the disjunctive, and, as it may be termed, the disorganizing character of the inflammation of which the adipose membrane becomes the seat. If we compare the different elementary tissues of the animal body, we find that the nature of the inflammatory process, of which each becomes the seat, bears a relation more or less intimate and direct to the nature of its organization. All parts well provided with blood-vessels, and, therefore, highly organized, seem to have high vital energies, and great powers of resisting disorganization. Parts, on the other hand, less highly organized, and which have few or small-sized blood-vessels, may be said to have inferior degrees of organization, and to be less capable of resisting the vascular perversion in which inflammation consists. Thus the skin, the serous membranes, and the mucous membranes, all of which are highly vascular, possess also great powers of resisting the disorganizing effects of inflammation; and when these take place, either counteract this by some supplementary process, which inflicts no serious injury on the structure of the inflamed membrane, and does not permanently injure its functions, or, if actual destruction ensue, it is not by direct death of the part, but by the minute atomical absorption named ulceration, and at the same time the vessels make attempts,

though sometimes abortive, to repair this species of destruction.

When the skin is inflamed, the secreting power of its exterior or cuticular surface is destroyed for a few days, and the cuticle is exfoliated, until the surface returns to its natural state, and secretes again new cuticle; or the outer surface effuses albuminous serum, as in the case of Rose and Blebs, or the miliary eruption, shingles, and other varieties of herpes,—or may secrete purulent matter, as in small-pox, impetigo, itch, and similar eruptions;—but, after the process is completed, and along with it, the texture always makes efforts to prevent any destruction of its substance, and if destruction have taken place, repair succeeds.

In the case of the serous membranes, which consist almost solely of numerous minute arteries and veins with lymphatics, this protecting power during the process of inflammation is still more decidedly seen. The texture itself is never injured; but the moment that inflammation is established in it, its vessels secrete a sero-albuminous fluid, which coagulates spontaneously over the free surface of the serous membrane, and thus forms a protecting covering during the whole subsequent course of the disease; and this protecting covering afterwards presents nearly the same structure, and acquires properties quite similar to those of the membrane, from which it was produced. This power of reproducing itself is indeed more distinctly presented by the serous tissue than perhaps by any other in the whole organic frame; and it seems to be intimately allied with its highly organized character.

The mucous membranes possess a similar power of resisting the destroying effects of inflammation, in their faculty of secreting thickened mucus, puriform mucus, puriform serum, the peculiar coating denominated the diphtheral, and even in certain circumstances coagulable lymph. Of all these processes, the final intention is evidently to shield the membrane itself from the destroying effects of the inflammatory process; and we find, accordingly, that after each of these processes is passed, in ordinary circumstances, the substance of the mucous membrane is either uninjured, or, if at all affected, the injured surface generally is capable of performing its wonted functions. Thus even in cases of diphtheral inflammation of the throat, we find that the membrane itself is uninjured in structure, and

though red, raw, and extremely tender during life, it is simply covered by a coating of albuminous mucus, which is destined to cover it, till the inflammatory state subsides. In the case also of inflammation of the intestinal mucous membranes we see thickened mucus, and mucus tinged with blood, and even a species of albuminous exudation secreted for days and weeks, without breach of the surface, and evidently intended to avert such a catastrophe, until the inflammatory phenomena disappear, when the membrane gradually recovers its natural condition and properties.

My limits do not allow me to consider at length the apparent exceptions to this principle, otherwise it would appear distinctly that these were only confirmations of the fact now stated,—that the protecting faculty of any tissue against the ravages of inflammation depends very much upon, if it be not directly proportioned to, its organization, or the size and number of its nutrient vessels. The principle is also very clearly illustrated in the inflammation of the adipose membrane, in which an imperfect, and, indeed, an inferior degree of organization seems to be the main cause of the destructive effects of that process. In that tissue inflammation is no sooner established than it proceeds rapidly to death, chiefly because the texture has not powerful vital energies, and is less capable than others of resisting the tendency to destruction. It possesses less of the independent form of vitality which the vascular system communicates to all the elementary tissues of the frame, and hence sinks more easily and promptly under the influence of the perverted or impaired vascular disorder in which inflammation consists.

It is not unlikely that this is also one of the principal causes of the peculiar irritative characters of the febrile disorder with which the inflammation of the adipose tissue is attended. We know that in the case of inflammation of highly organized tissues, as the serous membranes, the character of the concomitant fever is often distinct and acutely inflammatory,—much perverted action of the vascular system, but little of the nervous system, and much less of the overpowering prostration and oppression of all the vital powers which attend inflammation of the adipose membrane. In the one case, the actions of life seem to be simply increased, and are certainly perverted, and in one respect augmented in intensity. In the other,

they are oppressed and overpowered ; and the full vigour of reaction, as it has been named in the mechanical language of the iatro-mathematicalschool, is not permitted to develope itself.

But it is not only in its constitutional effects that inflammation of the adipose tissue is a malady so important. From its intimate union with the parts which it incloses, its destruction entails their destruction ; and, if it do not prove fatal by the severity of the febrile disorder which it induces, it may do so by the ravages which it causes among muscles, nerves, and blood-vessels. I mentioned its tendency to expose and denude the blood-vessels ; because in almost all the dissections which I have seen and performed of this disease, I have found the vascular sheath more or less diseased, sometimes destroyed, and the vessels exposed, the veins thickened and inflamed, and the arteries brittle, softened, and sloughy. In all these cases, however, the disease proves fatal, either by the intensity of the febrile disorder, or by causing inflammation of the veins, or passing to some internal organ, as for instance when it affects the adipose membrane of the chest, and thence passes, as I have seen it, to the *pleura* and lungs. It cannot be doubted, however, that, were life not terminated in either of these modes now mentioned, the destruction of the adipose tissue, forming the sheath of the vessels, would have the effect of producing death in the arterial tunics, and rupture of these vessels. We know, that when the sheath is by any means detached from the arterial tunics, either by disease, or accident, or in consequence of operation, a result almost inevitable is death of these tunics, chiefly in consequence of the destruction, which the nutrient vessels, the *vasa vasorum*, necessarily sustain by the inflammation of the adipose sheath, by which these vessels are supported. That this has not been more frequently observed in cases of spontaneous inflammation of the adipose cushion, is to be ascribed to the fact, that the disease in general proves fatal by the severity of the constitutional disorder, or by the induction of inflammation of the veins, passing from their external to their internal coat.

It is proper to remark, that in an abstract of the case of inflammation of the periangular adipose tissue above referred to, in the *Archives Generales*, (iii. New Series, Dec. 1837,) Mr Godin, the author of that notice, has attempted to oppose the view that the disease consists in inflammation of the adipose membrane, by

representing it to be diffuse phlegmon. I have only to remark, that this is a contradiction in terms, which, instead of conveying a correct view of the disease, tends to confuse still more than formerly. The view given by me rests on the accuracy of the anatomical observations; and unless these are shown to be erroneous, I see no mode of denying the fact, that in most of the cases of diffuse inflammation the adipose membrane is the chief seat of the disease.

The management of this disease has been frequently left to the surgeon; but its general principles should be stated here, as the physician, who has frequent occasion to treat it in its commencement should thoroughly understand these principles. The treatment is general and local. The first thing to be done is to determine whether the season has arrived for local treatment. If it has not, the bowels ought to be freely opened; and if the pulse be full, strong, and vibrating, twelve or fifteen ounces of blood may be taken from the arm. This plan should be followed by the exhibition of antimonial solution in minute doses until squeamishness or moisture of the skin takes place. If the affected part be much swelled, eighteen or twenty leeches should be applied, and the limb afterwards immersed in hot water. If leeches cannot be obtained, scarification and cupping, if the parts can bear it, may be practised instead. But the most efficacious local treatment is that by deep longitudinal incisions through the skin, adipose membrane, and fascia, if requisite, into the cellular substance and muscles. The blood discharged from these incisions will most effectually obviate inflammation, while the incisions will relieve tension, pain, and weight more readily than any other method, prevent the extension of inflammation, and promote adhesion. They may be about an inch and a-half in length, two or three inches apart, and varied in number from six to eighteen, according to the extent of surface which the disease occupies. Bark is recommended, but ought to be given only during convalescence.

§. III. Induration; (*Scleroma*.) The disease known to occur in infants, and described under the name of Induration of the Cellular Tissue, I believe also to be seated in the adipose membrane, which becomes firm, hard, resisting, and as it were infiltrated with coagulable matter and serum. I merely mention it here in its proper place. For further details, I refer to the Elements of Pathological Anatomy, Chap. ii. §. ii. 5. p. 45.

CHAPTER V.

INFLAMMATION OF PARENCHYMATOUS, SOLID, OR COMPOUND
ORGANS. *PHLEGMASIÆ PARENCHYMATOSÆ.*

THE solid, parenchymatous, or compound organs have not many common points of resemblance. For though all of them agree in consisting of several elementary tissues, and contain blood-vessels, nerves, and absorbents, connected by delicate filamentous tissue, and are invested with membranous envelopes, the proper matter of which they consist is so different in each, that it is impossible to compare them in this respect with each other. Thus, the brain differs from the lungs; the lungs from the heart; the heart from the liver, and this last, though a glandular organ, is very different either from the kidneys or the testicles. It is therefore not to be expected that we shall discover any very general features of resemblance, and perhaps it is unnecessary to search for such characters. It may be remarked, however, that, when inflamed, they do not give rise to the same urgent or acute constitutional effects which take place in the membranous inflammations; the process is more tedious, or partakes more of the chronic character, and is in general less amenable to the operation of remedies. The peculiarities and other general marks will be best understood in the history of each inflammation. I take them in the following order;—the Brain; the Lungs; the Heart; the Liver; the Spleen; the Pancreas; the Tonsils; the Tongue; the Kidneys; the Prostate Gland; the Testicle; the Womb and Ovary; and the Female Breast. I shall nevertheless endeavour to consider the inflammatory states of the glandular organs as much as possible together.

§. I. Inflammation of the Brain. Sturdy, Etourdie. Staggers? *Encephalia*. *Cephalitis*, Sauvages, Borsieri. *Inflammatiō Cerebri*. *Encephalitis*, Costantin, Frank, Hildenbrand. *Sphacelismus*, Hippocratis ex Bartholino, Ettmuller et Borsieri. *Siriasis*, Hippocratis. *Phrenismus*, Vogel. Phrenesie, *Gallicè*. *Cephalite*, *Encephalite*, Pinel et Bouillaud. Hirnentzündung, German. Zapalenie glowy, Polon. *Malacismus*, Ramollissement du Cerveau, Rostan, Lallemand. Softening or Pulpary Destruction of the Brain.

Caroli Fred. Costantin, M. D. *Dissertatio de Encephalitis*. Lipsiæ, 1800. Ext. in Brera Sylloge. Vol. vi. p. 72.—Dissert. sur l'Apoplexie considérée spécialement comme l'effet d'une phlegmasie de la substance cérébrale. Par P. A. Dan de la Vauterie. Paris, 1807 4to.—Essai sur la Cephalite ou Inflammation du Cerveau, par M. Ducrot. Paris, 1812.—Recherches sur une Maladie encore peu connue, qui a reçu le nom de Rammollissement du Cerveau, par L. N. Rostan, Médecin de la Salpêtrière, &c. A Paris, chez Bechet. 1820.—Recherches Anatomico-Pathologiques sur l'Encephale et ses Dependances, par F. Lallemand, Professeur de Clinique Chirurgicale à la Faculté de Médecine de Montpellier, Chirurgien en chef de l'Hopital Civil et Militaire de la même Ville, &c. &c. Paris, 1820–21.—On the Pathological Anatomy of the Human Brain and its Membranes, by David Craigie, M. D. Edin. Med. and Surgical Journal, Vol. xviii. p. 487. Edin. 1822.—Traité Clinique et Physiologique de l'Encéphalite ou Inflammation du Cerveau et de ses suites, telles que le Rammollissement, la Suppuration, les Absces, les Tubercles, le Squirrhe, le Cancer, &c. par J. Bouillaud, D. M. P. Paris, 1825. 8vo.—The Morbid Anatomy of the Human Brain, being Illustrations of the most frequent and important Organic Diseases to which that Viscus is subject. By Robert Hooper, M. D., &c. London, 1826. 4to.—Pathological and Practical Researches on the Diseases of the Brain and Spinal Chord, by John Abercrombie, M. D., &c. 2d edit. Edin. 1829. 8vo.—Traité des Plaies de Tête et de l'Encephalite, principalement de celle qui leur est consecutive, &c. par J. P. Gama. Offic. de la Legion d'Honneur, Chirurgien en Chef, &c. Paris, 1830. 8vo, pp. 400.—Reports of Medical Cases, selected with a view of Illustrating the Symptoms and Cure of Diseases by a reference to Morbid Anatomy, by Richard Bright, M. D., F. R. S., &c. Vol. ii. Diseases of the Brain and Nervous System. Part i. London, 1831. 4to.—On Serous Effusion from the Membranes and into the Ventricles of the Brain, and its connection with Apoplexy and other Diseases of the Brain, by John Sims, M. D. Medico-Chirurgical Transactions, xix. p. 265. London, 1835.—On Hypertrophy and Atrophy of the Brain, by John Sims, M. D. Ibid. p. 315.

Though inflammation of the brain has, under the different denominations above-mentioned, been recognized as a peculiar disease by various authors, practical and systematic, yet on several points considerable discordance of opinion has been entertained. It had been long known, that in various affections with symptoms of disorder of the nervous system, death by stupor, coma, or apoplexy, with or without convulsions, was liable to ensue; and it had been also known, that sometimes appearances of redness and injection of the substance of the brain were recognized, and sometimes it was impossible to detect any unequivocal morbid changes. It had been also known, that occasionally in the inspection of dead bodies, purulent matter sometimes on the surface, sometimes in the substance of the brain, was found; and, though in some of these cases symptoms of fever had been present, in others no well-marked symptoms had been observed, till a short time or within a few days previous to the fatal event. Upon the evidence of cases

of this description, Sauvages gave the disorder a place in his order of Parenchymatous Inflammations, under the name of *Cephalitis*. (Classes iii. Ord. iii. Gen. xix.)

In this he was followed by Sagar, who, after shortly enumerating the symptoms, adds, that he had three times observed the disease, and after death in each case he found purulent matter in the brain. (Cl. x. Ord. iii. G. xii. 310.)

Vogel, on the other hand, believed that it was impossible to distinguish by the mere symptoms, which are very equivocal, between inflammation of the brain and inflammation of the membrane, and he accordingly refers both to the same head under the name of *Phrenismus*. Genus xlv. In this he was followed by Cullen, who, for the same reasons, referred inflammation of the parts contained within the cavity of the *cranium*, including the membranes and the substance of the brain itself, to the general head of Phrensy or *Phrenitis*.

Borsieri, on the contrary, followed the example of Sauvages, and may be regarded as the first author who has drawn, on the grounds of morbid anatomy, a distinction between cerebral and meningeal inflammation on the one hand, and the affection denominated Sphacelismus on the other. By investing, however, the mere symptom of pain in the head with the importance of a disease, and referring to the inflammatory variety of pain, several cases of abscess of the brain and cerebellum, he has at once encumbered his nosological method with a useless and superfluous distinction, and rendered his descriptive and pathological views less simple and philosophical than they would otherwise have been.

The practice of Cullen has received the sanction, first of the two Franks, and afterwards of both Hildenbrands, who have concurred in treating of inflammation of the brain, *cerebellum*, and spinal tube, and their membranous investments under the general denomination of *Encephalitis*,* or *Enkephalitis*.†

It cannot be doubted that it is in practice extremely difficult to distinguish between the two disorders; and it may not be exaggeration to say, that in any given set of cases with symptoms indicative of disorder of the parts contained within

* *Praxeos Medicæ Universæ Præcepta*, auctore Josepho Frank. Partis iidæ. due Vol. i. Sectio i. Cap. iii. de *Encephalite*. Taurini, 1821.

† Valentini Nob. ab Hildenbrand, *Institutiones Practico-Medicæ*, Tom. iii, B. *Inflammationes Particulares*. A. *Inflammationes Cephalicæ*, p. 65. Viennæ. 1822.

the skull, scarcely any physician can, from the symptoms alone, form a positive opinion as to the pathological cause or causes of these symptoms, being seated in the brain or in its membranes, and any attempt to establish more precise diagnosis would in many cases unavoidably lead to error. This inference derives rather strong confirmation from the example of Sauvages himself, who has referred to the head of *Cephalitis*, various affections such as the *Dem el Muia* of the Egyptians, which others have regarded as examples of meningeal inflammation.

The subject has since undergone revision and consideration with the aid of morbid anatomy, by Baillie, Rostan, Lallemand, Bouillaud, Abercrombie, Hooper, Bright, Andral, Carswell, and Cruveilhier; but, notwithstanding the researches of these authors, this question is involved in as much obscurity as before. It is to be observed, however, that this difficulty refers chiefly, if not altogether, to the necessary connection between the external symptoms and the acute seat of the lesion, whether in the substance of the brain or in the membranes. It is indeed chiefly a difficulty in diagnosis, and which, from the nature of the subject, will probably remain long if not always in a most conjectural and uncertain state.

It is also to be observed, that the objections now stated do not prove that inflammation of the brain does not take place, or does not take place separately from that of the membranes. Both of these points are clearly established by numerous facts. And the pathologist has still to consider the question, whether cases of this kind present any distinctive symptoms, which may enable the physician to determine during life whether inflammation of the brain be present, what is its extent, and whether there be any hope of preventing it from proceeding to the formation of products, incompatible with the continuance of the functions of the organ, and consequently the life of the patient.

A necessary part of this inquiry is to point out certain sources of difficulty; and as these will be most easily understood by previous knowledge of the anatomical characters of the disorder, these I shall now shortly describe.

Inflammation of the substance of the brain was originally believed to be either rare, or almost unknown; for it was generally supposed that such a process could scarcely exist in the delicate substance of the cerebral matter, compatible with the continuance of life. Cullen maintained idiopathic inflam-

mation, or that without external violence, to be very rare. Baillie believed that it is not very common when no external violence has been applied to the head; that when it does take place, it is confined to one or more distinct spots, which assume a red colour not particularly intense; that this colour is found on incision to arise from many small vessels which are filled with blood; and that the portion thus affected has no peculiar hardness, but yields nearly the same sensation to the touch as it would do in a healthy state. This distinction of cerebral inflammation into idiopathic, or spontaneous and symptomatic, or traumatic, may be of importance in reference to the remote and exciting causes, but does not alter the question as to the anatomical and physical characters of the disorder, or the pathological effects which it produces on the brain.

The anatomical characters of cerebral inflammation are very similar in the beginning of the process; but they vary very much in its course and towards its termination; and consequently considerable difficulty results in the description both of effects and symptoms. The best means of obviating this difficulty is to follow the method hitherto observed in this treatise, of describing the process as it occurs in successive stages. It must be observed, however, that these stages are never so distinct in nature as we are obliged to make them in description; and they pass into each other by gradations so gentle that it is often impossible to perceive them.

Inflammation of the cerebral substance may be represented as a deranged, disordered, or perverted state of the capillary circulation of the organ tending to the formation of various morbid products, with more or less considerable change in the structure of the organ. The number of stages varies according to the nature of these morbid products. But taking the longest course as the average standard, they may most conveniently be distinguished into three.

1. The first stage is distinguished by the following circumstances. The substance of the brain is traversed by numberless vessels which give it a red injected appearance; and it is swelled and rather firmer than usual. When it is divided by incisions, the blood issues in numberless little drops, which, though at first dark, become crimson-red after exposure to the air, and form a strongly marked contrast to the white or gray ground, the substance of the brain. To this sprinkling of the cut surface

of the brain with drops of blood, the term *sanded* has been occasionally given. In some instances this vascular congestion is so intense and general that, at certain points, the capillary vessels have given way, and blood is then infiltrated into the cerebral substance, or it is collected in minute extravasated portions. This is, strictly speaking, the only condition to which the name of first stage can be justly applied. It is the only one in which the appearance of the brain and its vascular system is quite uniform. After this period the condition of the brain varies in several different modes. In this state the vascular injection may subside spontaneously, or under the use of various means.

2. If this do not take place, another series of appearances is observed. The vascular congestion continuing, the motion of the blood through the vessels is either very much impeded or almost wholly retarded, and one, two, or three different results will follow.

a. Sero-sanguine or serous fluid may be extensively infiltrated into various parts of the brain, the cohesion and tenacity of which are in this manner much diminished; and if this proceed, it is found that a fluid consisting partly of serum, partly of purulent matter, is infiltrated into the substance of the brain, with more or less complete destruction of the part so affected, and such a degree of diminished consistence as to be distinguished by the peculiar name of softening or mollescence (*Malacismus.*) This state appears to be analogous to the early stage of diffuse inflammation in the filamentous and some other tissues.

At the same time there is generally more or less change in the colour of the brain, which varies according to the stage, extent, and progress of the disease. If death have taken place early, the part of the brain so infiltrated is generally some shade of red, viz. faint rose-red, tile-red, amaranth-red, hortensia-red, that is, of the colour of the flowers of the *Hydrangiu hortensis* of Decandolle, or of the colour of the lees of wine. If death have taken place at a later period, these shades of red are less numerous, less extensive, and less intense. Patches of a faint red, or red brown-colour, are seen here and there; but the intermediate portions are of a stone-gray, a pale-yellow, (primrose-yellow, Syme,) or a green colour, and the surrounding space is generally of a gray or dirty cream yellow. If death have taken place at a period still later, most of the red-coloured spots and patches are gone, and the portion of brain is of a more or less uniform gray, or

cream-yellow colour. The yellow colour is sometimes darker or more vivid, approaching to the gamboge-yellow; but certainly the most common is the cream-yellow. At a period which seems to denote a still more advanced stage of this affection, the portion of softened brain is of a dead white resembling milk, when the natural colour of the white cerebral substance seems to be rendered more intense, chiefly by the infiltration of sero-purulent or purulent matter.

It must be further observed, that in these changes in the colour of a portion of brain which has been the seat of inflammation, the pathologist will not fail to recognize the various transitions from red injection and vascular distension, more or less intense, and more or less extensive to the brown, green, yellow, and whitish colours of the softened part afterwards found. Thus the early stages are marked by the crimson-red, amaranth-red, or hortensia-red colour of the parts; the latter by shades of lilach or brown. It may be said, that the brown at least, when it has any shade of red, is nearer to the period of injection than the green, the green than the yellow, and the yellow than the white. In many instances, more or fewer of these coloured portions are combined in the same portion of softened brain. But in general the order of succession as to softening succeeding to inflammation is that now specified; and while that which is of a reddish tint is most near to the recent inflammatory injection, that partaking of the yellow or the dead white is the most remote from that stage.

It must further be manifest from the fact now stated, that it would be easy to distinguish several of the changes in colour and consistence into separate stages, or rather to represent them as indications of particular stages. The reddish softening, for example, might be conceived to be one stage,—that namely, immediately consecutive to the reddish injection; and the green, yellow, and white are in all probability later or more advanced stages than the red. At the same time they are so frequently seen together, the reddish being at the margins, and the green or yellow or white in the centre of a softened portion of brain, that this refinement is scarcely admissible in practice, and perhaps it would afford no great practical advantage.

b. In another class of cases, the general injection already described terminates in the effusion of red blood to a greater or less extent into the substance of the brain, constituting a

true hemorrhage of the brain, (*Hemorrhagia Cerebri*). This shall be more fully considered, both in its nature and in its effects, under the head of Apoplexy. At present, it is sufficient to say that inflammatory injection may, and often does terminate in hemorrhage, and that hemorrhage is often the effect and termination of inflammation. The presence of blood effused into the substance of the brain, acting as a foreign body, gives rise to a species of reaction, or slow inflammation, in which, while part of the blood is removed by absorption, the containing portion of the cerebral substance becomes soft, irregular, rough, and disorganized. This constitutes a more limited and circumscribed species of softening. The extravasation of the red blood is not only an effect of the inflammatory congestion, but it also acts in the meantime as a termination of the disease, the proper symptoms of which gradually subside after the blood has been extravasated.

c. In a third class of cases, the general vascular injection and distension, after continuing some time, becomes less intense and violent, generally, but terminates in one part of the brain, in the formation of purulent matter in a separate collection, with walls more or less distinctly circumscribed. When such a collection is examined after death, it is found in general, that the purulent matter is collected in one or two cavities, irregular in size and shape, but the walls of which are rough, and flocculent interiorly, but a little firmer than the surrounding cerebral substance, and that the latter is free from injection, vascularity, or infiltration. This appears to be, with the occasional want of prominent previous symptoms, the principal reason why these collections have been often believed to be formed without previous inflammation. The reason, however, is not conclusive. I have already laid it down as a principle, that it is impossible to admit the formation of purulent matter, without the previous existence of some degree of inflammation; and even in the cases in which no symptoms have been observed, and no redness or softening is found after death, I do not see that it follows that these collections were not the effect of inflammation. The facts only which morbid anatomy discloses, I have already stated. I shall now give what I term the pathological deductions, as to cases of this class.

All the facts hitherto known show that in the brain, as in other organs, two forms of abscess are observed to occur. One is the acute ordinary purulent collection, the immediate result

of acute or subacute inflammation. The other is the chronic abscess, the result of chronic inflammation.

In the case of the first, there is every reason to believe that the vascular injection, which constitutes the first stage, is like that in the inflamed state of the filamentous tissue, both general and intense; but that at some particular point it becomes more intense and concentrated than at others; that the circulation becomes there so much impeded, that blood is effused, with a considerable proportion of serum and *liquor sanguinis*; and as this process of effusion advances, the gradual separation of the extravasated fluid into lymph, sero-purulent, and purulent matter takes place. The coagulable matter or lymph adheres to the portion least destroyed, while the liquid portion is contained within this, and forms the purulent collection. This is an expression of the fact, as it is observed in cases of cerebral abscess. The only point which can become the subject of inquiry is, why the coagulable part adheres in this manner to the least injured portion; and of this it is difficult, if not unsafe, in the present state of our knowledge, to give any other explanation than to say, that such is the fact. As in the inspection of such cases, almost uniformly the surrounding portion of the brain is found to have recovered its natural colour and consistence, I think we are entitled to infer, that the general vascular injection has disappeared, in proportion as that which terminated in suppuration became more intense, and concentrated to one or two points. In cases of this class, if it were allowable to speculate as to the final causes or ultimate intentions of these processes, I think it might be said, that, to save the whole from the general and inevitable destruction which I have shown must ensue in cases of this general inflammatory injection, one part, which becomes the seat of intense destroying action, is sacrificed; and it always depends on the site of this part, and its importance in the general performance of the functions of the whole region, whether this sacrifice is to be attended with fatal effects, or partial and temporary recovery.

This species of purulent collection may occur either, 1. primarily, as now described, in consequence of inflammation of the cerebral substance; and in this case the inflammation may be spontaneous, or the consequence of violence applied to the head, as in the case of falls or blows; or, 2. secondarily, that is,

in the course of the intense form of typhoid fever called Jail Fever. Of this several examples occurred to Marteau de Grandvilliers, Pringle, Costantin, and others. The inflammatory process and purulent collections thence proceeding, in such circumstances, cannot justly be regarded in any other light, than as complications of the febrile disorder, and perhaps effects of its action on the brain. Above all, it is impossible to admit them to be the cause of the febrile disorder, however much they may modify the symptoms and influence the manner of death.

In the case of the second variety of purulent collections in the brain, we have few or rather no very clear or strongly marked facts to guide us. All that is known is, that these purulent collections are formed in the substance of the brain and *cerebellum*; that they are formed without prominent symptoms of pain in the head, until they have subsisted a considerable time; that a long time is occupied in the process of suppuration; and that, in some instances, such collections are found in the brain without their existence having been ever suspected. In general, these collections are contained within membranous walls of substance, rather firmer and more tenacious than the surrounding portion of brain; and hence they are said to be *encysted* abscesses. From the circumstance of their being found most usually in persons presenting marks of the strumous diathesis, they are conceived to be of strumous origin. They are in this and all other respects connected with, or analogous to, the cold or congestive abscess taking place in the filamentous and other tissues.

The matter contained in these abscesses may be homogeneous, that is, it may be a uniform, opaque, fluid or semifluid, liquid; or it may be heterogeneous. In the first case, the matter is opaque, of nearly uniform consistence, of a greenish-white or primrose-yellow colour, sometimes with one or two masses of firm coagulable lymph. In the second case, it is partly serous and thin, of a white or pale greenish-white colour, partly thick and curdy; and large masses of coagulable lymph, or granular or flocculent pieces, are found in it. The fluid is also sometimes found slightly reddish, or tinged with blood. It is sometimes inodorous; but occasionally it exhales a fetid smell.

The appearance and structure of the cyst deserves attention,

in so far as it contributes to illustrate the nature and origin of these collections. It is almost uniformly much firmer and more tenacious than the surrounding portion of the brain; and indeed, it is principally by this circumstance that its character of cyst is established. Its thickness varies, both in different cases and in different parts of the same cyst. In most instances, it is as thick as a half-crown piece; but in several, it may be as thick as a copper penny. In others, it is very thin, and is made to give way by a very slight force, even that employed in removing the brain. The inner surface is always rough, irregular, and flocculent, with numerous portions of albuminous matter. The outer is more uniform, and, though not quite smooth, can in general be distinguished from the surrounding portion of brain in which the cyst is imbedded. In several cases, blood-vessels of considerable size, and rather numerous, are observed, connecting the brain with the outer surface of the cyst.

These purulent cysts vary in size from that of a filbert or small gooseberry, to that of a small apple or orange. Dr Hooper delineates in the third figure of his ninth plate, a globular one, which appears to have been from two inches and a-half to three inches in diameter.

They take place chiefly in the cerebral or cerebellic hemispheres,—a circumstance which is connected with the fact, that in these situations chiefly, if not exclusively, could these collections be formed without deranging so much the functions of the brain as to cause death.

Upon the mechanism of the process by which they are formed, pathological observers are not agreed, and in general they have been satisfied with representing them as quite analogous to the chronic or congestive abscesses occurring in other organs and regions of the body, under the influence of the strumous diathesis. Bouillaud regards them as indicating the third period of *encephalitis*, and seems to think that they constitute a more advanced stage of the same morbid process, which consists in purulent infiltration into the cerebral pulp; in other words, that the matter poured out at several points breaks down the intermediate portions of brain, and thus converts several small separate purulent cells into three or two large communicating cavities, or finally into a single purulent cyst. This may be the course of events in several varieties of abscess or purulent collection in the brain, and is very probably true with

regard to those, in which a purulent cavern with rough flocculent walls and irregular in shape and size, is formed in the hemispheres of the brain. But it seems not very probable, when applied to explain the origin of the encysted abscess, because it is impossible to perceive how this disruption could account for the formation of the firm cyst. If we consider the course of phenomena in inflammation and abscess of the brain, and compare it with what is observed in the abscess of other tissues, and the purulent collections of the serous membranes, it appears to me that the following is the manner in which they are formed.

Inflammatory congestion taking place in any part of the brain, in which its presence does not immediately derange much or wholly suspend the functions of the organ, terminates there in the separation and extravasation of a considerable proportion of the sero-albuminous part of the blood over the whole space in which the vascular congestion had taken place. Separation takes place at particular points into albuminous matter and serous or sero-purulent liquid. In the course of this separation, however, the whole inflamed space may be regarded as consisting of two portions; one in which the vascular injection and distension with impeded circulation is so far advanced, that it is impossible for the vessels again to recover their powers, and for the blood in the greater part of them to be again circulated in the normal manner; the other, in which this vascular injection is so much less intense, and the impeded circulation has been so much more temporary, that, under certain circumstances, they may again recover themselves, and carry on the circulation in a natural manner. At the line of boundary or union between these two portions, the inflammatory injection and distension is in that state which is favourable to the separation of the *liquor sanguinis* into its two constituent elements, albumen and serum; and while the former is in the course of coagulation and deposition, along the line where the inflammation is assuming the adhesive form, the latter trickling from it, as it coagulates and adheres, necessarily forms a fluid, which though at first serous, yet afterwards, by admixture of albuminous matter, becomes sero-purulent or purulent, and, as this process of separation and deposition continues, accumulates so as to form a purulent collection within the layer of coa-

gurable lymph, which then gradually acquiring greater firmness and tenacity constitutes the pseudo-membranous sac or cyst.

In the whole of this process we observe a close analogy between it and that which takes place in the purulent collections within the serous membranes.

It is observed that in some instances these cysts are formed of several membranes which can be distinguished from each other. This Bouillaud ascribes to the establishment of adhesive inflammation around the first formed membrane, and the successive formation of additional deposits round each. It is not impossible that these concentric membranous layers may be formed in this manner; and it may be added, that their formation, according to the hypothesis now stated, is quite as intelligible as in any other mode.

These cysts are further, in some rare instances, transformed into fibrous or fibro-cartilaginous tissues; and still more rarely they become encrusted with calcareous matter.

A question has been stated by Bouillaud, whether the matter within these cysts be ever absorbed; and he is disposed from analogy to believe that it may; that the walls may be thus mutually approximated, as in large pleuritic effusions; and that several cicatrized fissures in the brain, hitherto viewed as apoplectic cysts, must indeed be regarded as the termination of attacks of cerebral inflammation. All that can be said on this point is, that such absorption may, if the cyst be not very large and the contents abundant, be not impossible. But the actual occurrence is still to be regarded as a circumstance requiring demonstration.

I have said that Bouillaud considers these purulent collections as representing the third stage of cerebral inflammation. I am disposed to regard them as merely the suppurative stage, of a different and perhaps a distinct kind of cerebral inflammation, for the following reasons. 1. There is no ground to believe that the stage of general infiltration precedes or terminates in that of encysted abscess. 2. In cases of general infiltration of blood, serum, and sero-purulent matter, a much smaller proportion of the brain is left in such a state of integrity, that it could recover its natural appearance and structure, than is found in cases of encysted abscess. 3. In cases of sero-purulent or purulent infiltration the disease is very generally connected with a morbid state of the arteries of the

brain, viz. ossification, steatomatous deposition ; but in cases of encysted abscess this state of the arteries is not usually observed. 4. In cases of sero-purulent or purulent infiltration, as above described, the symptoms are of a different character from those of mere purulent collections.

From all these circumstances, I am disposed to regard these two affections of the brain as different from each other. The sero-purulent or purulent infiltration, I think, is analogous to the diffuse inflammation of the filamentous tissue. The purulent collection or abscess contained within membranous walls, on the other hand, I think, is analogous to the encysted abscess, acute or chronic, of the same tissue, or of those organs of which that tissue forms a constituent part.

Some authors, for instance Bouillaud, look on a fourth stage of cerebral inflammation as being found in the presence of tubercles, scirrhus, and encephaloid productions, cartilaginous, bony, and calcareous deposits, melanotic, and erectile formations. Whatever ground may exist for considering the presence of the first-mentioned sort of bodies, as indicating the existence of the fourth stage of inflammation, I am certain that there can be none for viewing any of the others in that light. I have elsewhere considered these bodies in their anatomico-pathological relations, as observed in the brain, and attempted there to arrange them on these principles ; and I must, in the meantime, refer the reader to that treatise* for more minute and detailed information than the limits of the present work will allow me to give. All that I think it necessary to say here on the same subject may be stated in the following manner.

Tubercular or tyromatous growths or deposits may take place in various parts of the brain, *cerebellum*, or spinal chord, either in consequence of inflammation, acute or chronic, or along with that process ; and when they do take place, they very uniformly give rise to the phenomena of chronic cerebral inflammation and softening. Tyromatous matter may be deposited in the brain in two forms at least ; either in that of a soft pulpy viscid matter, like putty, or a mixture of chalk and water, deposited to various extent in the brain, or in that of isolated masses, spherical, spheroidal, or amorphous, in various parts of the brain, *cerebellum*, or spinal chord. In the former

* Elements of General and Pathological Anatomy, Chapter xiii. §. ii. 9, p. 447—480.

case it seems to be an earlier stage of the process, which seems to be inflammation of a peculiar kind. In the latter, these bodies appear to be formed slowly and insidiously, and only at a certain period of their growth to derange so much the capillary circulation, as to cause inflammation of the brain, or of its membranous coverings. They are very generally and justly regarded as indications of the strumous diathesis.

But in whatever manner, and under whatever influence, these tyromatous bodies are formed, they consist in general of whitish gray, or cream-white matter, chiefly albuminous, deposited without distinct organization or internal arrangement, homogeneous, tough, more frequently friable,—and susceptible of induration by exposure to heat or immersion in any of the acids. They appear to be formed merely by the effusion of albuminous matter, sometimes purulent matter, in a liquid form, which afterwards undergoes not coagulation but aggregation. This inspissation, at least, is evidently not the spontaneous coagulation observed in healthy *liquor sanguinis*, or the lymph of inflammation; but mere mechanical aggregation, by more close approximation of its particles. It becomes friable, but not tough.

Very commonly these bodies are surrounded and enclosed by a net-work of vessels more or less multiplied, and more or less minute.

After they have continued for some time, they are liable to produce in the surrounding portion of brain inflammatory softening, and sometimes meningeal inflammation, terminating in serous effusion (*hydrencephalus*); and hence they are a cause not unfrequent of that disease.

Of the other tumours enumerated by myself, in the work already referred to, I cannot regard any as the result of mere ordinary inflammation, either of the brain or of its membranes. All of these growths and accidental formations, however, agree in this circumstance, that they in the course of time give rise to more or less inflammation, and consequently to softening and suppurative destruction. It hence results that the presence of these tumours or growths in the brain is at the close of the disease complicated with the symptoms of cerebral injection, infiltration, and softening.

The foregoing account will convey some idea of the phenomena of cerebral inflammation in its different stages; and I

think the whole process may be distinguished in the following manner.

The *first*, or earliest stage, is that of vascular injection and distension, when the capillaries are unusually distended and loaded with much blood, which either moves very slowly, or remains almost stationary within the vessels. This is the only stage from which recovery is ever effected.

The *second* stage may consist, *a.* in minute or abundant hemorrhage; *b.*—in infiltration of serum, or crude sero-purulent matter; or *c.* in incipient separation of the *liquor sanguinis* into lymph and serum.

The *third* stage may consist of infiltration of perfect sero-purulent or purulent matter, or the collection of matter in a separate abscess or cyst.

Though I have already spoken of softening or pulpy destruction of the brain, as an effect and consequence of inflammation, it is a lesion so important that it may be proper here to specify shortly its different forms in a systematic manner.

1. Phlegmasial or simple Inflammatory Softening, (*Encephalia Mollescens.*) This is perhaps the simplest of all the forms of the disease. It is that which ensues in the early or incipient stage of inflammatory injection, and appears to be chiefly caused by the presence of a large and unusual quantity of blood within the cerebral vessels.

2. Hemorrhagic Softening, (*Malacismus Hemorrhagicus.*) This may also be regarded as a simple form of softening, especially if the hemorrhage take place at an early stage of the vascular injection. Both this and the last are liable to terminate in that state of the brain which shall be noticed afterwards under the name of Atrophy of the Brain.

3. Phlegmasio-hemorrhagic softening, (*Malacismus Phlegmasio-Hemorrhagicus.*) This may be regarded as a combination of the two last-mentioned. It embraces often the reddish, the amaranth, the hortensia-coloured, and the wine-lee softening, and sometimes the greenish-yellow softening.

4. *Malacismus Albicans.*—In the dead white softening, the portion of cerebral matter is converted into a soft semifluid pap, very similar to thick cream; and it is quite impossible to recognize any of the natural organization of the cerebral substance. When exposed to the air, and unsupported by the membranes and adjoining parts of the brain, it melts or is

liquefied in a cream-white semifluid substance. This is found to take place not only in the brain and *cerebellum*, but in the spinal cord. In the latter case, of which I have seen three examples, it gives rise to slowly advancing *paraplegia*, the first symptoms of which commence in the toes and feet, and occasionally in the fingers, and then proceed to affect the legs and thighs, and eventually the trunk; not long after which, the respiration becomes deranged, hiccup and occasional vomiting appear, the belly becomes tympanitic and painful, and death ensues. This may be denominated liquefaction of the brain. It is the effect of chronic inflammation; and appears to be a variety of suppuration. It is very uniformly connected with steatomatous or osteo-steatomatous transformation of the cerebral and spinal arteries.

5. Reddish-brown softening may be regarded as a species of gangrene of the brain, and seems to correspond to that state which Hippocrates believed to take place in the disease, to which he applied the names of *Sphacelismus Encephali*. It is most frequently the consequence of inflammation of a malignant character, in which blood is early extravasated, and consequently the inflammatory action partakes of the gangrenous softening. It is always associated with more or less disease of the arteries of the brain, which are rigid from osseous degeneration.

To this the greenish-red or greenish-brown softening is closely allied, and it seems therefore to be merely a variety of the last mentioned.

This, like puriform collections, has been known to take place in the course and at the close of typhoid fever. (Elements of Pathological Anatomy, Chapter xii. Section ii. 2, p. 381, 383.)

6. *Malacismus Centrencephalicus*. Central softening.—Lastly, a species of softening is observed to take place in the central parts of the figurate surface of the brain. The *fornix* or vault and its ceiling and margins become soft and pulpy, so that the delicate lines of their surfaces can no longer be recognized, and when touched or moved, they fall into a soft pulpy whitish cream. The *septum lucidum* is either completely softened, or attenuated, reticularly perforated, or entirely broken through; and the whole *fornix* is rent through from the anterior crura. Though this may take place with very little fluid within the lateral ventricles; yet most commonly it is associated with a

considerable quantity of fluid in that situation. There is reason to think, therefore, that, though the softened and lacerable state of the brain is partly the effect of the inflammatory process, it may be also in some degree produced by distension, stretching, and tearing, and also by the macerating operation of the fluid.

This change is usually found in different states. In the first place, it is most frequently observed in children who have laboured under, and been destroyed by, symptoms of acute or subacute meningeal inflammation; and it must in that case be regarded as one of the effects of inflammatory congestion of the central division of the cerebral membranes, viz. the choroid plexus, which is always attended with more or less inflammation in the central figurate surface of the brain. In the second place, it occurs in the subacute or chronic meningeal inflammation of adults and aged persons, and, which is most usually dependent upon, a rigid or otherwise diseased state of the cerebral arteries. In this instance, it gives rise to the symptoms denominated lethargy. In the third place, it is observed to take place in cases of continued fever, with cerebral or cerebro-meningeal disorder (*Typhus*,) especially at the close of that disease, and is then the cause of the fatal termination.

Sclerencephalia.—Under this name I formerly described that state of the brain, in which more or less of it becomes preternaturally indurated. It may seem singular, that, after treating of softening as one of the consequences of the inflammatory process in the brain, I mention induration as a consequence of the same process. But morbid anatomy shows the latter state to be one of the peculiar effects of chronic inflammation taking place under particular circumstances in the brain. Notwithstanding the authority of Bouillaud on this point, who, along with Gaudet, represents this induration to take place from ten to fifteen days before death, I am inclined to believe, that it is much more frequently a lesion which occupies a considerable space of time. In the most strongly marked case of this kind, which came under my own observation, the symptoms of disordered circulation and function in the brain lasted for several months, I think from sixteen to twenty. There were pain of the head, but especially the right side, almost constant, occasionally much aggravated; epileptic attacks recurring at uncertain intervals; loss of memory, impaired energy of judgment;

and, lastly, a fatuous expression of the countenance, paralytic feebleness of one side, viz. the left, stupor, and eventually fatal coma. Upon inspection after death, I found a large portion of the right hemisphere of the brain very much indurated, with preternaturally strong adhesion of the membranes to the hardened part. This induration extended for the space of from eight to nine inches in the antero-posterior direction, between two and three in the superior-inferior direction, and at its greatest depth, corresponding to a little below the parietal protuberance, it was about three-quarters of an inch. It formed altogether a portion of brain not unlike the segment of a spheroid. Its firmness was about the consistence of brain, indurated by dilute nitric acid, or moderately hard cheese. The internal structure of the part was not altogether destroyed, but very much changed. At the inner margin of the indurated portion, and towards its posterior extremity, the contiguous portion of brain was reduced to a soft semifluid mass, not unlike bread-crumbs moistened with water. This disease had come on spontaneously, apparently, in a young man of about 24 years of age.

Most of the facts known regarding this peculiar induration of the brain show that it may occur in connection with a chronic inflammatory state, and that it is also associated with more or less softening. For more detailed information, I refer to the Elements, and the works therein mentioned. It is often designated by the name of Hypertrophy; and perhaps this epithet may not be improper where the substance is simply indurated, and the density of the organ increased. But very rarely is the lesion confined to this change only; and uniformly almost there is change both of structure and colour. This seems to be the result of the presence of a large proportion of albumen. According to Dr Sims, it never affects the *cerebellum*.

Atrophy may also be noticed as a state which is the result, at least, of inflammation of the membranes, and is sometimes associated with that of the brain. Its anatomical characters are, flattening of the convolutions, with more or less shrinking and diminution of their size. Of this several good examples are given by Cruveilhier.

In not a few instances, again, the term atrophy is employed to designate that state of various portions of the brain and *cerebellum* which is known to succeed the hemorrhagic softening

and the phlegmasio-hemorrhagic softening. The part of the brain, in cases of this class, presents an appearance like bread-crumbs moistened, or like porous soft cheese, or sometimes is in the form of a cavity, containing serous fluid, with irregular flocculent walls. In other instances, part of the brain acquires a fawn-yellow or tawny orange colour, and is soft, like jelly or a pulpy mass. There is no doubt that all these states are the remote effects of inflammatory or hemorrhagic injection.

In the brains of persons accustomed to the free, excessive, or habitual use of spirituous liquors, it is not uncommon to observe on various parts of the convoluted surface, circular or elliptical spots, varying from the size of a vetch or millet-seed to that of a garden pea, of a fawn-yellow colour, or of the tint of unbleached bees-wax, soft, and without the usual anatomical characters of the convoluted cerebral matter. When these fawn-coloured patches are divided by the knife, they are observed not to penetrate to any depth in the brain,—not beyond a line or half a line, and they are found to consist of a peculiar yellowish or fawn-coloured soft semifluid-like substance. These patches seem to be the result of inflammatory or phlegmasio-hemorrhagic congestion taking place in spots either in the convoluted surface of the brain, or, perhaps, in the filamentous-vascular productions of the *pia mater*. They may be regarded in the same manner as the others now mentioned as atrophy in spots.

In employing this term, however, I must say, that I use it rather in compliance with general custom, and to prevent confusion, than because I am satisfied of its propriety. All the changes and states which I have mentioned it is employed to designate, are the effects of inflammation either of the membranes or of the brain, or of serous effusion from the vessels of the former, or of hemorrhage from those of the latter, or softening in its substance. If this circumstance be kept in view, the name itself is of less moment.

II. SEMIOGRAPHY.—After the view now given of the anatomico-pathological characters and effects of inflammation of the brain and *cerebellum*, I have next to direct attention to the question of the connection between these states and the symptomatic effects, and to inquire whether the several changes now specified are in all cases attended with symptoms so distinct and uniform as to enable the practitioner to recognize the pre-

sence of cerebral inflammation, and to estimate its degree and extent.

As soon as we enter on this inquiry we perceive several difficulties and impediments; and though I do not pretend to enumerate the whole of these, the following remarks will convey some idea of the principal.

1. By far the most serious of these, it appears to me, consists in the practice followed by nosologists, of converting into individual diseases certain phenomena presented in the functions of the nervous system, which ought, if not in all cases, at least in the majority, to be regarded as symptoms. Thus, in the systems of Sauvages, Vogel, and Sagar, catalepsy, *Lethargus*, *Cataphora*, *Carus*, and apoplexy, in that of Cullen, apoplexy, catalepsy, and palsy, are described as genera of diseases, when in correct pathology they ought to be considered as mere symptoms. In the same manner the different forms of tetanus, convulsive motions, and epilepsy, have been by all these nosologists regarded as individual diseases, when they also ought to have been described as symptoms and symptomatic effects. It may appear a great and violent innovation to depart from the example set by authors deservedly held in high esteem by physicians; but morbid anatomy and correct pathology clearly prove, that the whole of these complaints bear to various morbid states of the brain and its membranes the same relation, which quick, difficult, and laborious breathing, or *orthopnoea*, cough, and expectoration bear to those of the lungs; and ought, therefore, upon the same principle, to be no longer considered as individual diseases, but as symptoms and effects of certain lesions of the brain, especially in its capillary circulation; and as I am convinced that the practice pursued by these nosologists has led to great confusion, and to several errors, both in reasoning and writing, on the diseases of the nervous system, in so far as the same disease is necessarily twice introduced in the arrangement,—first, as a pathological process, and, secondly, as a series or assemblage of symptoms, I see no alternative but to abandon it, if we wish to observe perspicuity and consistency. No skilful pathologist can behold either loss of power in the muscles (*Paralysis*,) deranged sensation (*Anaesthesia*,) or irregular and involuntary action in the voluntary muscles, or loss of consciousness or memory, without inferring, that there must be some unhealthy state of the brain, the *cerebellum*, or the

spinal chord, or their membranes, or in the circulation of these parts.

2. The second circumstance which deserves attention among the difficulties attending this enquiry, is the fact, that in different regions of the brain inflammatory injection, sanguine and sero-sanguine infiltration, and even purulent infiltration or collection, and softening, produce very different effects. No fact is better established than this, that a moderate degree of injection of one part of the brain essential to memory, consciousness, or judgment, or connected with nerves distributed to organs essential to life, produces very great derangement in the functions of the brain itself, and also in those of other organs, while considerable injection of another part may take place without giving rise to symptoms sufficiently serious or lasting to excite suspicion. Moderate injection of the *crura* of the brain, or the annular protuberance (*Pons Varolii*,) or the bulb of the chord (*medulla oblongata*,) speedily gives rise to symptoms of irritation, indicated by convulsive, spasmodic, and tetanic motions, and then to loss of power (*paralysis*) generally, with stupor and coma, usually followed by speedy dissolution. It hence happens, that very seldom do we find blood effused, or purulent matter infiltrated in these situations, because the vascular injection of such parts is sufficient to disturb the functions of the brain so much as to produce the fatal termination before such changes can be effected.

Thus I saw a woman brought to the hospital at the hour of visit in a state of stupor, from which she could be easily roused, but could not long be kept. She was admitted under the care of my friend, Dr Spens, by whom treatment was adopted with judgment and promptitude. The same evening, nevertheless, she fell into a state of complete stupor, from which she could not be roused. The limbs were at first slightly rigid, then more completely so, especially on the right side; afterwards they were altogether relaxed and motionless; and the patient was in a state of complete coma for seven or eight hours. Death took place on the following day. On inspecting the brain, after most careful examination and dissection, the only morbid appearance which I found was much capillary injection and red coloration of the left *crus cerebri*, and pink-coloured injection, with slight softening of the right *crus* and its connection with the optic chamber.

In this case, therefore, and all similar cases, we must infer, that the inflammatory injection of the *crura* injures so much the functions of the brain, that life is interrupted before there is time for purulent infiltration, suppuration, or abscess.

Conversely, considerable injection may take place in the hemispheres near the convoluted surface, and may proceed to purulent infiltration or abscess, without immediately interrupting the functions of the organ so much as to suspend or destroy the action of the lungs and heart. In a woman of 25, who came under my care in the Royal Infirmary of this city, on the 16th February 1837, with symptoms of pneumono-bronchial disorder, I had distinct evidence that inflammation of the brain had been proceeding at least for eight days, during several of which it had given rise to no conspicuous symptoms, except pain of the temples, which was removed by bleeding from the application of sixteen leeches,—occasional vomiting, and sometimes a degree of slight stupor, or rather listlessness and absence, from which, however, she could always be roused. At length on the 21st, five days after admission, though in her usual state at the visit, and with the pulse at 60, I received information that she had become insensible with palsy of the one side. Upon visiting her immediately I found her insensible to all stimuli, unconscious, breathing about sixteen times in the minute, not stertorously, the pupil contracted, the pulse still at 60, and the left arm inflected rigidly, and incapable of being extended. Depletion, general and local, was actively employed, and carried to a considerable extent, and she recovered both her senses and the use of her limbs. The symptoms, however, recurred, with extreme rapidity of pulse, 120–140; and the patient died on the 6th of March, about thirteen days after the first distinct symptoms of unconsciousness and insensibility, and at least three weeks and a half after the first symptoms of illness. Inspection disclosed, in the posterior part of the right hemisphere, an oblong cavity filled with opaque greenish-yellow purulent matter, not communicating with the ventricle, but so near the surface of the convolutions at the posterior and mesial margin of the hemisphere, that it burst during the act of removing the brain from the skull. The whole course of the disease in this case was about twenty-six days.

In this and similar cases I think we are entitled to infer, that the situation of the disease was the principal, if not the

sole, reason why it did not sooner give rise to morbid symptoms, and why it proceeded to the formation of matter. It is manifest that vascular injection must in this case have preceded the formation of purulent matter; and it is also manifest, that the injection did not at first affect a part of the brain necessary to sensibility, impressibility, consciousness, and voluntary motion, since none of these functions were in any manner disordered; and that it was only after the injection had proceeded to purulent destruction of the organ, and had thereby occasioned first irritation and then compression, that the symptoms became prominent, urgent, and eventually fatal.

The accuracy of the conclusions now stated is confirmed by the history of all the recorded cases of suppuration and purulent collections in the brain or *cerebellum*. In all the cases of purulent collection in the brain recorded by M. Lallemand, whether spontaneous, or ensuing, as is usually the case, on external violence amounting to at least 24, the purulent matter was found either over the convoluted surface, as in 10 cases, or it was infiltrated into the hemispheres forming suppurative softening, or it was collected within a cavity, more or less distinctly circumscribed, forming an abscess in one or other hemisphere. Nor is this proposition less true with regard to encysted collections of purulent matter, in which, at the point of union between the portion of brain injected so as to be capable of restoration to its natural state, and that which is incapable of this restoration, lymph is deposited more or less extensively, so as to constitute an enclosing cyst. Of this class of cases, Lallemand records 16, exclusive of those in which the cerebral suppuration was the effect of suppurative inflammation of the internal ear; and in the whole of these cases, collected from various sources, the collections were contained within one or other hemisphere.

In the first class of cases, or those in which the matter is found on the outside of the convoluted surface, there is little doubt that the inflammatory action is originally seated in the minute vessels and filaments which connect the *pia mater* to that surface. It might be said, therefore, that this is rather a meningeal than a cerebral inflammation. But when it is remembered that these vessels penetrate the substance of the convolutions, and that, strictly speaking, the cerebral substance becomes the seat of the inflammatory process, solely by its possessing and being penetrated by blood-vessels, this objection

loses its force ; and whether, therefore, the matter be found contained within the cerebral substance or immediately over its surface, it must be regarded as the effect of genuine cerebral inflammation.

3. In the *third* place, I am led here to observe, that a considerable source of difficulty in establishing a fixed and precise relation between morbid action in the brain, and the external symptoms, arises from the circumstance, that, though the membranes are often affected with congestion and inflammation, or its effects, without the brain being affected, very rarely, almost never I may say, is the substance of the brain, *cerebellum*, spinal bulb, or spinal chord in a state of inflammation without the membranous investments being more or less inflamed at the same time. Of the truth of this proposition, we daily see numerous pointed confirmations. I have repeatedly seen the arachnoid membrane injected, and its subarachnoid tissue much infiltrated with serous fluid, the *pia mater* injected and thickened, and the *dura mater* much thickened, and the ventricles containing fluid, yet without any trace of redness or alteration in the consistence of any part of the brain. Conversely, it is observed, that, when the substance of the brain is the seat either of inflammatory or hemorrhagic injection, or of softening or of suppurative infiltration, or of suppuration, not unfrequently the membranes adjoining the immediate seat of the disorder, and often those covering more remote parts, become sooner or later also the seat of injection, and serous or sero-albuminous infiltration, more or less extensive. The accuracy of this proposition is very fully established by the phenomena of inflammation ensuing on external injury, and those consequent on disease of the internal ear and pyramidal portion of the temporal bone.

4. In the *fourth* place, when the whole brain, including the *cerebellum*, and spinal bulb, (*medulla oblongata*), is affected with general, though slight injection and congestion, it necessarily gives rise to much greater disorder in the functions of the organ, than when only the brain alone, without the *cerebellum*, or the *cerebellum* without the brain, or one hemisphere of either, or a small part only of the hemispheres, is affected. This is so obvious that it does not require illustration. It is sufficient to observe, that it is partly referable to the second proposition, in so far as the minor is included in the major. General in-

flammatory injection of the brain, or a large portion of one or both hemispheres, indeed, approaches in the effects which it produces on the cerebral and nervous functions, to injection, ordinary or intense, of the *crura* of the brain, the annular protuberance, or the spinal bulb. It also approaches in the same circumstances to injection or inflammation of the membranes, and is in several cases accompanied with meningeal injection.

5. In the *fifth* place, the distinctness and urgency of the symptoms of cerebral disorder will often depend much on the circumstance, whether the inflammation be acute, and of short duration and rapid progress, or chronic, and of long duration and slow progress. I have shown in my *Elements of Morbid Anatomy*, (p. 384–386,) that suppuration of the brain may be the effect either of acute or chronic inflammation. The terms *acute* and *chronic* are certainly rather vague and indefinite. But in general, pathological writers have considered the disease acute in the following cases; 1st, when, after symptoms of cerebral disorder, for instance more or less palsy and rigidity of the extremities, the fatal termination takes place within one week, or within two, but with appearances of injection or softening after death; 2^d, when, after similar symptoms, death takes place within three weeks, and either part of the brain is infiltrated with purulent matter, or matter is collected within two or three small cavities, or one cavity, more or less regular, more or less complete, and more or less distinctly circumscribed. When death ensues at a later period than the third week, such as on the thirty-third day, or the fiftieth day, or the fifty-fifth day, either the disease must be regarded as subacute throughout, or after having been acute at first, it must be considered as having become subacute. 3^{rdly}, when cases of suppuration of the brain occur, in which there is a clear evidence, that from the first commencement of symptoms to the termination in death, a space of time longer than that now specified, has taken place, these may be ranked among the family of chronic inflammations.

In the first order of cases, the symptoms are generally distinct and urgent throughout, and the progress of the disorder from its origin to its fatal termination is rapid. In the second order of cases, the symptoms may be at first distinct and urgent, but may abate or become less intense; yet not unfrequently they are insidious and obscure. In the third class of cases the symptoms are obscure, and generally so far from be-

ing urgent, that the first indications are palsy, rigidity of the muscles, and stupor approaching suddenly a day or two before death.

After these preliminary observations, I come to consider the particular symptoms or external morbid phenomena with which the change is most usually accompanied.

1. In all cases of cerebral inflammation, symptoms of fever more or less distinct, and more or less urgent are present. The correctness of this proposition, I am aware, Lallemand and some other authors question; and cases are adduced in which, though purulent matter or suppurative infiltration is found in some part of the brain, yet the pulse, it is said, has not been more frequent than natural. Certainly, if by fever it be only meant to express acceleration of the arterial beats, it might be argued that fever is not a constant accompaniment of cerebral inflammation. This, however, is a view too limited. Though the pulse may not be more rapid than natural, nor remarkably changed in its character at the commencement of the attack, yet other circumstances indicate the presence of febrile disorder. Thus the patient has chills, transitory, or permanent, readily feels cold, seeks the fire, and yet is unable to keep himself warm. The skin also deviates from the natural state. That of the scalp is generally hot, and sometimes sweatings are observed about the head and face, and nowhere else. The extremities, on the other hand, are cold, and in general, though they can be made warm, it is impossible to render them moist by the usual cutaneous transpiration. These with thirst may be regarded as the most constant and essential symptoms of febrile disorder.

As to the pulse, though that may not be quicker than natural at the commencement and during the first days of the disorder, as the morbid process advances and affects the brain more considerably, it generally becomes quick, and sharp, but oppressed, as if the artery were not allowed fully to expand itself. In the case which I have already mentioned, the pulse was 72, and 68 during the four first days of the disorder, and 60 on the day when the first symptoms of unconsciousness and loss of voluntary motion took place. After blood-letting, when some consciousness was recovered, it rose to 96, but was small and oppressed, then to 120, fell again to 104 and 108, and for several days previous to the fatal event it was never below 136, and was often above 140.

When we consider the results obtained by other inquirers, we find that in general they lead to the inference, that the motions of the organs of circulation are seldom much affected. Thus M. Dan de la Vauterie, in a case observed by him, states that the pulse was natural. M. Lallemand also, after examining the history of 46 cases observed by himself or others, and finding that in four only, viz. one by Salmuth, one by Bauhin, one by Dan de la Vauterie, and one by Dr Abercrombie, were febrile symptoms mentioned in vague general terms, concludes that inflammation of the brain exerts no direct influence on the circulation, and that when fever takes place, it is independent of the cerebral disorder.

Not very dissimilar is the view taken by Bouillaud, who represents the influence of *encephalitis* on the circulating organs to be scarcely perceptible, and who contends that when they present any disturbance, these are occasioned either by disorder in the motions of respiration, from convulsive or other abnormal affections of the respiratory muscles, or are the consequence of some other disorder either of the alimentary canal or other organs, with which the cerebral inflammation is complicated.*

According to Andral, though the pulse sometimes remains natural in cerebral inflammation, it is in general accelerated; but he allows that, from the cases considered by him, it results that the circumstance of the pulse being natural or quickened, depends solely on individual predispositions.

Among 227 cases of softening of the cerebral hemispheres, either simple or with marks of inflammatory congestion, or with incipient hemorrhagic effusion or purulent secretion, the pulse presented in the number of beats the varieties specified in the following table:

Pulse normal in	-	-	26 cases.
Pulse slow in	-	-	15
Pulse accelerated in	-	-	72
Pulse first normal, then frequent in			10
Pulse frequent, then slow in	-	-	2
Pulse not observed in	-	-	97

From these numbers it results that in nearly one-third of

* *Traité Clinique et Physiologique de l'Encephalite*, ou Livre II. Article Vquieme, p. 303, 304. Paris, .

all the cases, and in more than one-half ($\frac{1}{2}$) of all the observed cases, the pulse was more frequent than natural, and that in fewer than one-fourth ($\frac{1}{4}$) of the whole amount, and about one-third of the observed cases, was the pulse natural or slower than natural.

From these facts it may be inferred, that in general the pulse is quicker than natural, and that when it is natural or slower than natural, it is not safe to trust to that alone, but it is requisite to take into consideration the other symptoms.

As to the character of the pulse, it is variable, sometimes oppressed, sometimes soft. In several of the cases recorded by M. Rostan and M. Lallemand it was irregular or intermittent; and in such circumstances the irregularity or intermission is almost invariably found to be connected with disease of the heart, or of the aorta.

The temporal arteries, and sometimes the carotids, are observed to throb with a singular degree of fulness, force, and tension.

2. The motions of respiration are rarely affected in the incipient stage of the disorder; and so long as the injection, softening, or suppuration is confined to the cerebral hemispheres. But when the disorder has gone on for several days, when a considerable portion of the hemispheres is either unusually injected, is the seat of hemorrhage, or becomes infiltrated with purulent or sero-purulent fluid, or matter is collected within a cavity, the motions of respiration become first languid and slow, inspiration is not full or complete, then becomes difficult or impracticable, then the respiratory motions become irregular, feeble, and inadequate, at length rapid, but feeble though laborious, and this state usually precedes death only a few hours.

This irregular state of the respiratory motions in *encephalitis*, sometimes slower, sometimes more rapid than natural, has been also remarked by Bouillaud as one of the most constant symptoms in disordered respiration. With the feebleness of the motions, the incompleteness of inspiration, and the languor, I think it is by far the most common mode in which respiration is disordered. Stertorous respiration is not constant, and it is chiefly observed in cases in which, with softening of the hemispheres, there is either capillary hemorrhagic injection, or red softening of the *crura* of the brain, or some change in the annular protuberance.

In general, when the inspiration becomes incomplete, and the respirations are either languid or variable in rapidity, a rattle begins to be heard over both sides of the chest, first behind and below, then all over; and this continues till the last gasp, evidently producing death by a species of slow asphyxia, or passive peripneumony. The lungs are in such cases found extremely gorged with dark-coloured blood, and bloody serum mixed with frothy fluid oozes profusely from the bronchial tubes and lungs when they are divided by incisions.

3. Most authors, as Rostan, Lallemand, Bouillaud, and Andral, represent the digestive functions to be in general not disordered, or, if they be, not to be necessarily deranged. This does not accord with what I have myself witnessed. In several cases in which either symptoms of palsy indicated the approach of softening, or pain of the head was attended with inflammation of the brain, sickness or vomiting were early and in general obstinate symptoms. Upon one occasion I saw a case in which sickness and occasional vomiting was ushering in an attack of cerebral injection, where an emetic was prescribed to remove the gastric symptoms, and the vomiting following which was succeeded by deep coma, which was removed only by copious blood-letting, general and local, with purgative clysters. In another case obstinate vomiting preceded paralytic symptoms, which were evidently dependent on softening of part of the brain. In the case of abscess of the brain already referred to, occasional vomiting, was, with pain in the temples, the only symptom of illness for at least six or seven days. It is true that, as the disease advances, this symptom disappears; and in cases in which stupor or coma approach rapidly, it is seldom observed. But in the majority of cases in which the disease approaches gradually and proceeds not very rapidly, vomiting, not unfrequently preceded by dyspeptic symptoms, as flatulence, cardialgia, and squeamishness, is an early and rather a conspicuous symptom of the approach of that cerebral injection, which is to terminate either in suppurative infiltration, pulpy destruction, or abscess of the brain.

I feel it the more requisite to direct attention to this circumstance, because I have known cases occur, in which, after vomiting took place, it was regarded as the symptom of what is vaguely called a bilious attack, and perhaps treated by emetics or stimulants or antacids, when it proved by the result to be

one of the preliminary symptoms of hemorrhagic injection or inflammation of the brain, and should have formed the sign for such depletion as might be adequate to arrest the further progress of the disorganizing process. Vomiting, in short, in plethoric persons, advanced in life, attended with headach, giddiness, or confusion, should always excite the suspicion of the medical attendant.

It is quite possible, nevertheless, that vomiting may be not an essential or necessary symptom. It is possible, for example, that it may be the effect of that degree of faintness which is often observed to take place in any sudden change in the current of the circulation, especially of the brain. Thus in some persons, when a small quantity of blood is drawn, faintness, paleness, and sickness, come on, and are succeeded by vomiting, after which the faintness and paleness disappear. Vomiting is also most apt to take place in such circumstances when the individual is in the erect posture, and is sometimes prevented from taking place by placing the patient in the horizontal posture.

When, on the other hand, we remember that sickness and vomiting take place in various forms of meningeal inflammation, when it is known, as shall be seen, that moderate injection or irritation of certain parts of the brain, is followed by irregular motions in the external or internal muscular organs to which nerves with cerebral connection are distributed, and that excessive injection or destruction of the same parts is followed by loss of all motion, and that the glosso-pharyngeal and pneumogastric nerves may, by irritation at their cerebral connection, cause some derangement in the sensibility and actions of the organs to which their ramified extremities are distributed, it will not appear unreasonable to infer, that, in the early stage of cerebral inflammation, when the parts of the brain are simply irritated, one of the effects of this irritation may be to derange the action of the stomach, so far as to induce squeamishness, sickness, and vomiting.

4. In whatever manner, and to whatever extent, the gastric functions are disordered in *encephalitis*, almost invariably those of the intestines and their attached glands are disordered. The bowels are always more or less, sometimes exceedingly, constipated, and are insensible or inert to the action of medicine in the usual doses. It may be said, that this is rather a

cause than a symptom of cerebral disorder. The distinction is unimportant. The fact is sufficiently established. It seems most rational to ascribe it to *inertia* of the intestines, and impeded circulation in their vessels, from suspension of the nervous influence over them.

As the disease advances, this *inertia*, and perhaps *anaesthesia* of the intestinal tube, especially of the colon and rectum, become more conspicuous and urgent. The excrementitious contents are never voided spontaneously, and hence become in their turn a source of irritation to the intestinal mucous membrane. The belly becomes swelled, sore, and tympanitic; tormina or griping pains, with frequent liquid motions, ensue, generally with more or less tenesmus. These symptoms are observed chiefly in chronic cases; and in general they precede for a few days the fatal termination. Andral represents them to induce profound coma, which accelerates the approach of the fatal event. This, I believe, is a mistake. It can hardly be said, that these symptoms of intestinal or gastro-intestinal disorder induce coma, since that symptom is the natural consequence of the advancing progress of the cerebral lesion. It seems more consistent with the usual course of diseases of the brain, to regard the intestinal disorder as the consequence of the previous torpid and inert state of the intestinal tissues, and the irritation of the intestinal tissues, and the consequent inflammation and augmented and morbid discharge as an additional cause of debility and exhaustion, which concurs with the state of the brain to the fatal event.

It is to be further observed, that a strong confirmation of the truth of this is found in the fact, that this exhausting diarrhoea of the last stage of *encephalitis* may be always restrained, and often prevented, by keeping the bowels in an open state in the early stage, by means of the regular administration of eccoprotic medicines.

— 5. Another circumstance to be here noticed, though less remarkable in the early than in the latter stage of the disease, is the state of the urinary secretion and excretion.

At the first approach of the disease the urine is rather scanty, and, though sometimes clear, yet more frequently, though clear when voided, it deposits on cooling, a sediment, which may be lithate of ammonia, or the ammoniaco-magnesian phosphate. It is, however, at this stage, though scanty, generally regularly voided. As the disease advances, however, and the

influence of the nervous system over the remote organs is diminished, the sensibility of the vesical mucous membrane is also impaired, and the wonted stimulus to empty the bladder, when moderately filled, is no longer transmitted to the brain. The urine, therefore, gradually accumulates until it fills and distends the bladder, from which it then escapes in drops (*guttatim*,) the large quantity mechanically overcoming the resistance of the sphincter. It is hence often supposed that the urine is not retained in the bladder, because it is constantly trickling from the urethra. The urine, nevertheless, is retained; and this retention is the cause of a series of other symptoms.

First, part of it is absorbed not only from the interior of the bladder, but also from that of the ureters and pelvis, and *infundibula* of the kidneys; and being taken into the system, is circulated with the blood, and is exhaled with a urinous odour from the surface of the whole body, giving rise to a peculiar smell like that exhaled by mice (*odor murinus*,) which is often observed in persons labouring under the various forms of cerebral softening. *Secondly*, besides this, it either modifies the febrile disorder, or induces a febrile disorder, which from this urinous or ammoniacal odour exhaled by the patient, has received the name of Urinous Fever (*Febris Urinosa*;) one of the symptoms of which is great increase of the heat and thirst, and at the same time the stupor of the patient. In the *third* place, the urine retained within the bladder is decomposed; and, however clear and limpid that may be which trickles away from the urethra, that which is left, which is the larger part, is like urine long kept in any other situation undergoing decomposition, and generally forms either lithate of ammonia or the triple phosphate, and sometimes sulphuretted hydrogen. The effect of these chemical changes in the fluid, combined with the mechanical irritation produced by inordinate distension of the bladder, is to induce inflammation of the whole or greater part of the vesical mucous membrane; and almost invariably the inner surface of the bladder, in cases of softening or puriform infiltration of the brain, is found reddened, injected, roughened, thickened, and secreting more or less puriform mucus. It is by no means improbable that this inflamed state of the vesical mucous membrane concurs to favour absorption of the urine, as absorption is generally more easily accomplished by inflamed than by healthy mucous surfaces.

6. The symptoms already enumerated, though accompanying the process of cerebral inflammation and its effects, are, however, not so closely connected with that process as some other symptoms yet to be considered.

By far the most characteristic and important symptoms are those presented by the several changes taking place in the functions of sensation, perception, memory, apprehension, consciousness, judgment, and those of the organs of voluntary motion.

These different functions are not affected to equal extent, or at the same time. In general memory, consciousness, and perception, remain longer unimpaired than the functions of sensation and voluntary motion.

a. In general the earliest symptom indicative of the commencement and presence of cerebral inflammation is more or less pain of the head, which is generally fixed and obstinate. Its situation varies. In some cases it is referred to one or both temples; in others to the coronal region; in some to the parietal; and in some to the occipital region. Taken alone, perhaps, it will not be sufficient to justify the conclusion, that the patient is labouring under cerebral inflammation; but if it be fixed and obstinate, if it be attended with feelings of weight or girding in the head, if it be accompanied with pricking sensations, with spastic rigidity of the limbs, or convulsive twitches of the face and head, or with stupor or delirium; if it be found in a person a little aged; it will be prudent to act as if there were incipient congestion or inflammation of the brain.

A great difficulty, further, is presented in availing ourselves of this as a symptom, in the fact, that in several of the best authenticated cases, either little or no pain of the head has been experienced, or if felt, the pains have been wandering and intermittent; and in other instances they have presented the appearance of hemicranial pains, or those which take place in hysterical subjects, and those of the nervous temperament.

The great inconvenience results from the fact, that pain is not a uniform symptom; either because the stage of healthy sensation and perception passes over very quickly; or because, in certain forms of the disease, the congestion does not affect a part of the brain, which is the seat of sensibility to pain; or because the disorder is not in all instances an acute inflammatory malady.

When pain takes place, however, it appears at the commence-

ment of the disorder, and often precedes all the other symptoms excepting the sense of chilliness, and the dryness and coldness of the skin and extremities. In some of the cases recorded by Lallemand, pain in some part of the head was felt for the space of one or two years previous to the actual occurrence of the characteristic symptoms of softening; but in cases of this class, as the *meninges* presented various marks of inflammation, he thinks it possible that these painful feelings may have been caused by morbid action in the investing membranes, rather than in the brain itself. He therefore draws a distinction between those long-continued pains (*cephalaea*,) and the *cephalalgia* which commences at once a little before the attack of the disease, and is generally accompanied with the symptoms already mentioned and others to be yet noticed. In several of the cases recorded by Andral, headach took place fifteen, twenty, or twenty-five, days before any other conspicuous derangement in health could be recognized. The most usual course, however, is for headach alone to be felt for a space varying from five or six hours to five or six days. In several cases treated by myself, the patients admitted that headach, more or less acute, preceded the paralytic shock for five or seven days.

When headach has once taken place, it may continue in different degrees of intensity, during the first period or stage of the disorder. But it frequently abates so much as not to be a subject of complaint; and it may disappear altogether as more or less stupor comes on; but even when delirium and some degree of coma take place, indications of pain in the head are evinced in the patient carrying the hand towards the head, and sometimes to a particular region of it. When stupor is complete, no indication of pain may be observed; but as sensibility is restored either in the course of the disease, or under the influence of suitable remedies, the presence of pain is more or less distinctly evinced in the hand being directed to a particular part of the head, and sometimes in the inarticulate murmuring of the patient. Thus in the female whose case I have already mentioned, though no complaint was uttered during the period of unconsciousness, as soon as, under the use of remedies, a slight degree of consciousness was recovered, she pointed distinctly to the right temporal and parietal region as the seat of uneasiness.

In some cases in which consciousness is only impaired and

not extinguished, when patients in this disorder are interrogated whether they feel pain in any part of the body, at first they seem bewildered, as if not comprehending the question; but if it be again proposed to them, and time is given to understand the question, they at length, with a look of greater intelligence, mutter slowly and confusedly, that they feel pain, and carry the hand of the sound side to the head; and in several cases the side of the head opposite to the limb, the motion of which is impaired, is the one to which they wish to apply the hand. This symptom, M. Rostan remarks, is of great importance, and is often alone adequate to characterize the existence of softening of the brain. Lallemand also remarks, that in this state, intermediate between somnolence and intelligence, patients habitually carry the sound hand to the head, and usually to the side of the head corresponding to the sound side of the body.

The headach accompanying cerebral inflammation and softening is not always definite in seat. It may be diffused over the whole head, when it is generally not very acute; or it may be confined to the frontal region, to one or both temples, to the parietal region or to the occipital region; and it is there generally more intense and severe. It is further to be observed, that the circumstance of the pain being diffused over the greater part or the whole head, or confined to one spot, does not accurately indicate the seat or the extent of the inflamed portion of brain.

The explanation of the whole of these peculiarities is to be sought in the same physiological and pathological circumstances.

In the healthy state the brain is altogether indolent or void of any sensation of pain; and no person in health is aware that he possesses a brain. In living animals, also, we learn from the experiments of Zinn, Flourens, Rolando, and others, that the brain may, within certain limits, be cut, torn, and otherwise injured, without giving rise to indications of acute suffering. But as soon as inflammatory congestion ensues, the organ that was previously insensible and indolent becomes the seat of suffering more or less acute and intense; and so long as this inflammatory congestion continues, without being so general and considerable, or giving rise to morbid products so great, as to destroy not only the structure, but obscure the functions of sensation and perception, these painful sensations continue to be felt. When, however, this congestion proceeds to any of

its characteristic morbid products, for instance sero-sanguine or sanguine infiltration, purulent infiltration, and destruction, or purulent collection, though the cause to a certain extent exists, as the percipient faculty of the brain is impaired, or perverted, or even destroyed, pain is no longer a source of complaint. In the same manner, a part of the brain which was the seat of pain in the stage of injection, ceases to be so when that injection has proceeded to sero-sanguine or sero-purulent injection, while the contiguous portion of brain in which the congestion still continues, is also the seat in some degree of painful sensation; and, hence, while the *corpus striatum* or optic *thalamus*, or both, may be completely softened, the patient may refer his headach to the frontal or occipital regions.

Again, as the hemorrhagic injection or softening advances, it may induce such disorder in the sensitive and percipient faculty of the brain, that, while the organic cause of the pain is seated in one part of the brain, the patient may refer the painful sensation to another. When headach continues for several days, and persists, notwithstanding removal of the hair, cold applications, general and local blood-letting, and the use of cathartic medicines, when it is aggravated by coughing, stooping, or the horizontal posture, when it is attended with a sense of girding in the frontal and temporal regions, or all round the head, or a sense of weight in the coronal and occipital regions, and when it is accompanied with giddiness and other symptoms to be immediately mentioned, it will be prudent to infer, either that the membranes are irritated and inflamed, or that the first stage of softening is going on.

b. Whether the patient complains of pain in the head or not, there is generally, if not always, more or less derangement in sensibility in various parts of the body. In the early stage of the disorder, while the cerebral vessels are still in the state of congestion, and while the cerebral substance is thereby irritated and unduly excited, the sensibility of the muscles and the skin is usually increased. Various painful sensations are felt either in the skin or in the deeper seated parts of the extremities; pricking pains or spasms and cramps in the muscles; a sense of insects creeping on the skin, on its substance, or beneath it (*myrmecia*; *formicatio*.) Afterwards, when there is reason to believe that the orgasm has proceeded to softening or puriform infiltration, the sensibility of the skin is either perverted or more or less impaired, neither cold nor heat, or other phy-

sical impressions being felt with the accuracy or facility of health, or sometimes the individual feeling as if grains of sand were interposed between his fingers and the bodies which he wishes to handle.

With regard to the derangement of the proper sensations, vision is usually indistinct and imperfect ; sometimes the patient is afflicted with dazzling flashes of light ; and rarely are the eyes affected with intolerance of light. Afterwards vision is indistinct, sometimes double, with *strabismus*, in some instances entirely gone, forming amaurosis. The latter I have seen chiefly when the disease affected the optic *thalamus* and the *corpora geniculata*. Palsy of one eyelid and sometimes of a whole eye, that is, of the muscles by which it is moved, producing distortion, are also occasionally observed in the advanced stage of the disorder.

In a few cases ocular *spectra* and prismatic colours (*pseudoblepsis*) have been known to take place in the early or congestive stage ; and in a yet smaller number spectral illusions (*phantasmata*,) in the form of distinct images, have been known to precede an attack. But, as in these cases the membranes were also found presenting marks of congestion and effusion, it is difficult to say whether the symptoms now mentioned were associated with the disorder in the cerebral or in that of the meningeal circulation.

It is remarkable that morbid acuteness of hearing (*Paracusis oryccæ*,) and ringing in the ears, are not frequently observed in the early or inflammatory stage of the disorder. More or less deafness (*paracusis baryccæ*, *Dyseccæ cophosis*), is a more common complaint ; and some persons suffer from this after ringing in the ears, or alternately with that symptom for some time previous to the occurrence of the paralytic symptoms, which usually indicate the establishment of the disorder. The patient may be either deaf in one or both ears, or more deaf in one than in the other. When he is deaf in both ears, Rostan thinks that the symptom denotes that the affection in general occupies the membranes, the circumference of the brain, or its centre. If deafness or perverted hearing be confined to one ear, it is probable that the lesion is also seated on one side of the brain, and generally on the same side.

The senses of smell and taste are also in general more or less impaired. Thus smell may be altogether extinct (*anos-*

mia;) and this is generally the case when the softening is seated in the *corpus striatum*.

In the same manner, the individual may be incapable of recognizing the differences of various sapid bodies (*Agheustia*;) and in general this is observed when the softening occupies the hemispheres. The privation depends then not so much on the *inertia* of the nerves of taste, as on the incapacity of the sensitive or percipient part of the brain to recognize the impressions made on them.

In the early stage of the disorder, while the vascular system of the brain is overloaded, and the brain is irritated, giddiness is not unfrequently observed, and sometimes it is continued, urgent, and distressing. This symptom, however, is not peculiar to cerebral inflammation, but is also found in meningeal disorder. In some instances it may precede the disorder for years. In the singular case of Swift, in whom the disorder was chiefly meningeal, giddiness with deafness lasted for a long series of years.

c. A state of agitation and restlessness, similar to what is denominated fidgettiness, is in several instances observed to take place in the early stage of the disorder; and if this symptom be accompanied with heat of the face and head, and coldness of the hands and feet, and followed by sickness and vomiting, it should lead the attendant to suspect disorder in the cerebral circulation, and to adopt suitable measures.

Conversely, a state of drowsiness or somnolence is not uncommon. Yet the individual sleeps in a very disturbed and imperfect manner during the night; moans much, sometimes cries out, or mutters or starts, and generally has frightful and confused dreams.

The memory is observed to be faithless, inaccurate, or confused; the apprehension is slow, and when questions are proposed, the individual does not always readily understand them, and takes some time to reply; the ideas are often confused, and intelligence becomes impaired. In some instances the moral faculties at the same time become changed, the individual being hasty and irritable, impatient of delay, and intolerant of contradiction or opposition. At the same time, it must be observed, that the symptoms here enumerated as taking place in the mental faculties, are often not observed until the disorder has subsisted for some time, for instance several

days, or even a whole week. In some instances he is dull and gloomy, dispirited and taciturn.

d. At the same time with the headach and symptoms of perverted sensation, or shortly after, the motions of the tongue are observed to be impeded. The patient speaks slowly, with hesitation, and sometimes less articulately than natural, and as if he had not the full command over the muscles of the tongue and lips.

In the members, at the same time, or soon after, the seat of several forms of derangement in the muscles of voluntary motion may be perceived. This derangement is chiefly of two different sorts.

In the first place, the muscles may be the seat of a degree of rigidity, or involuntary spastic traction, preventing the patient from using the limbs freely and in the natural manner. This spastic traction affects the flexor muscles, so as to inflect the limbs upon each other without the possibility of their being extended by the extensor muscles. This state is usually denominated in its various degrees, stiffness or rigidity (*Rigiditas spastica*), and contraction (*Contractura paralytica*, Cullen), or permanent contraction (Lallemand), and convulsive palsy by Bouillaud. Its characters as well as the condition which it indicates are peculiar. It consists in an inordinate and involuntary action of the flexor muscles, which the extensors are unable to overcome; it is generally accompanied with pricking pains of considerable intensity referred to the flexor muscles; and any attempt to produce extension forcibly is attended with great pain and suffering in the limb. It is to be observed here, therefore, that the power of the flexor muscles is not impaired, but it is irregularly and involuntarily increased, while that of the extensor muscles is diminished, and the individual has no control over either. As it generally precedes the state of complete loss of power in the muscles (*paralysis*), it has been usually regarded as a symptom of the early or congestive stage of cerebral inflammation, when the cerebral substance and the cerebral ends of the nerves are irritated by the overloaded state of the blood-vessels, so far as to pervert their functions, and, before the change is sufficiently intense and extensive, to extinguish these functions.

This symptom M. Rostan imagined, at one time, to be peculiar to the early or congestive stage of cerebral softening.

I have observed it, however, in the upper extremities, when inspection showed that there were only general meningeal congestion and infiltration, and the same admission I find made by M. Lallemand; but this he explains by adding, that it is impossible for the arachnoid membrane to be inflamed without the brain partaking more or less in the same disorder. (Lettre ii. p. 251.) It is the *pia mater* chiefly in this case, the congestion in the vessels of which gives rise to the same symptoms as the irritative action in the brain from congestion in the cerebral vessels.

Various degrees and forms of the spastic rigidity are observed to take place.

First, extreme contraction of the pupil I regard as a variety of it, because it is usually found associated with rigidity of the muscles of the face and upper extremities on those of one side. The eyelids may be spasmodically closed by rigid contraction of the *orbicularis*, the forehead spasmodically contracted, the mouth spasmodically shut, the lower jaw rigidly fixed causing *trismus*, and several muscles of the face affected with painful rigidity, mostly on the one side. The most usual form of the symptom in this region, however, is spasmodic contraction of the one angle of the mouth; and it is on the side opposite to that on which the lesion is seated in the brain;—a circumstance the reverse of what is observed in apoplexy, in which the mouth is drawn to the same side of the head in which the cerebral lesion exists. The involuntary and unconscious turning up of the eyes and squinting (*strabismus*), I refer to the same state of irritation; but I remark, that both, and indeed all the symptoms now mentioned, are found as frequently associated with various degrees of meningeal congestion, that is, congestion of the *pia mater*, as with cerebral disorder. It is true that in this case the congestion of the meningeal vessels produces in the convoluted surface of the brain, and particularly towards its basilar region, the same irritation, which the congestion of the cerebral vessels would themselves effect.

Secondly, when spastic rigidity or contraction affects the extremities, it varies in the degrees of its intensity. In very slight cases the thumbs and fingers are bent into the palm of the hand; and this is usually observed in infants in affections of the cerebral coverings, especially the *pia mater*. In more severe cases, the hand is bent upon the fore-arm, and cannot

be extended. In cases still more severe, the fore-arm and hand, with the fingers, are inflected upon the arm to various degrees, half, or very much. And in the most intense cases the inflection is so complete, that the thumb is applied to the shoulder.

When the *pia mater* over both hemispheres is the seat of congestion, and thereby irritates the whole convoluted and even the basilar surface of the brain, both superior extremities are inflected to a greater or less extent, in the manner now specified. Prehension, supination, and pronation, and indeed all the motions performed by fingers, hand, wrist, fore-arm, and arm, are then difficult or impracticable.

Thirdly, in the lower extremities analogous degrees of spastic rigidity take place. Thus the toes may be incurvated into the sole of the foot; and while the foot is extended upon the ankle, the leg is inflected upwards and backwards upon the thigh, and the thigh is inflected upwards and inwards towards the belly. In aggravated cases of this spastic contraction, the component parts of the pelvic extremities may be so much inflected, that the heel is pressed against the hip.

In softening of the brain, the most usual form of contraction is that in which the thoracic and pelvic extremities of one side are inflected more or less completely. When both lower extremities are inflected, it indicates, in general, the incipient or irritative stage of softening of the spinal chord.

Fourthly, in certain cases, this spastic rigidity affects the muscles of the larynx, and deprives the individual of laryngeal voice (*aphonia*.) It may also induce great difficulty in breathing and a sense of suffocation, while respiration is performed rapidly and with a hissing sound, causing crowing inspiration, (*Laryngismus stridulus*.)

In most instances the spastic rigidity is accompanied, not only with the tearing and pricking pains already mentioned, but with a sense of weight in the limb or limbs. It may alternate with convulsive motions, or pass into them. These disorders in muscular action take place in the limbs of the side opposite to that in which the congestive orgasm is irritating the brain. One case, however, deserves notice, not so much in the way of exception as of explanation. In certain cases of cerebral inflammation, both arms are more or less forcibly contracted upon the shoulder and trunk. But if the motions of

both be carefully observed, it will be found that one arm has lost sensibility, and remains paralytic or motionless, while in the other sensibility is left or increased, and it performs certain motions. In this case affection of the brain is complicated or associated with affection of the membranes; and the capillary injection of the brain is seated on the side opposite to that in which the arm is paralytic and anaesthetic.

Such, in general, is the state of the muscular system during the incipient stage of cerebral inflammation, or that in which the cerebral capillaries are overloaded with slowly moving blood, and in which, consequently, the cerebral substance is irritated, as it were, in innumerable minute points, by a fluid which acts like a foreign body.

As this morbid condition of the cerebral capillaries advances to sanguine, serous, sero-sanguine, or puriform infiltration, either the rigidity becomes more complete with increase in the muscular pains, and difficulty in prehension, or the limb or limbs are convulsed, or at length the patient loses all control over one side, which is then paralytic.

In the second place, instead of the paralytic state succeeding slowly to stiffness and involuntary contraction of the muscles, it may come on suddenly after slight or severe pain of the head and giddiness. The patient then either instantly loses the power of moving one limb or a whole side, constituting palsy of one side (*hemiplegia*,) or he falls down suddenly, as if in a fit of loss of consciousness, sensation, and motion; and in a few minutes, recovering consciousness and sensation, he finds that he has lost partially or entirely the power of moving one arm and a leg, or the whole of one side.

In other cases, the instantaneous loss of consciousness and sensation is accompanied not with complete loss of motion, but with spasmodic action of the muscles, in some instances of the face and mouth, in other instances of the extremities, and in others of the face, trunk, and extremities, assuming the appearance of the falling-sickness (*epilepsia*;) and when the patient recovers his recollection, he either finds the motions continue in one side, or the muscles are in a state of involuntary contraction and rigidity; and, after one or more epileptiform attacks, the loss of motion in one side is complete. Such was the case of the mathematician, Alexander Marchetti, as detailed by Valisneri.

To both these modes of attack the denomination of an apoplectic fit, or a paralytic stroke, has been very commonly applied; and the latter Borsieri has designated as spastic or convulsive palsy. The apoplectic seizure, or the loss of consciousness and sensation, is in general short and transitory, and subsides spontaneously; but the loss of power is much more serious and permanent, and too often continues or increases until it terminates in complete loss of consciousness, sensation, and intellect, and destroys life. The loss of muscular power in this case, as it affects one side of the body, is consequently denominated lateral palsy (*hemiplegia*.) Approaching in the mode now described, it is one of the most uniform, frequent, and certain symptoms of pulpy softening of the brain.

When it comes on suddenly in the manner of what is named a paralytic shock, without being preceded or accompanied with spasmodic symptoms, in general the first morbid change in the brain consists either in very sudden general injection of part of the brain, or in rupture of one or more vessels and hemorrhage, and the formation of a clot, around which, acting as an irritant and foreign body, the process of softening begins and continues till either the blood is absorbed, or is broken down and mingled with the portion of disorganized brain.

When the spastic contraction, or the paralytic state, is accompanied with epileptiform convulsions, it has been usually taught by the best authorities, especially Lallemand and Bouillaud, that the disease is complicated with meningeal congestion, causing cerebral irritation and the epileptic attacks, since in this class of cases marks of meningeal congestion or its effects were recognized after death.

A third mode in which the disease may proceed is the following. Without either spastic rigidity or contraction of the extremities, the sight begins to be feeble, and is gradually lost in amaurotic blindness; the speech also becomes thick, hesitating, and unsteady, so that the patient cannot readily or fluently express his desires, or communicate his thoughts; and the tongue when protruded, though not carried to either side, is protruded irregularly and unsteadily, and is maintained in a sort of spasmodic agitation. The mouth may be drawn aside or not; but when it is drawn, it is chiefly when the muscles of the face are contracted. At the same time, the arms and legs are not, properly speaking, contracted; but when the patient

attempts to move them, it is done in a slow, unsteady, jerking manner, something like the motions in the dance of St Vitus. The gait is unsteady, the patient dragging one limb not so completely as in *hemiplegia*, but with a sort of stiff imperfect motion, and the limb is at the same time the seat of a sense of weight and numbness. The shoulder of the same side hangs down, and the patient inclines to that side so much, that the trunk appears almost as if it were bent or incurvated to one side.

In this state of symptoms the disorder is confined to the surface of the brain all around and at the base, is slight in form, and does not penetrate to the deeper regions of the organ. When the same class of symptoms affects the two sides of the body, there is no doubt that the same disorder affects both sides of the brain.

Fourthly, the symptoms of the disease have been observed to approach in a fourth manner, which is too important to be omitted. Instead of the disorder appearing, first, with symptoms of impaired sensation and perverted motion, and then terminating in loss of motion, more or less complete, loss of motion in a slight degree commences in the toes or fingers, or in both, and affects the foot and hand, the leg and fore-arm, and the thigh and shoulder, and eventually the muscles of the trunk, rendering the patient quite helpless, and usually inducing mental imbecility and death. This form of the symptoms, which has received, from the progressive mode of its approach, the name of creeping palsy, is connected with, and dependent upon, progressive inflammation and softening of the hemispheres.*

The paralytic state of the side opposite to that in which the disease of the brain exists, had early attracted attention, having been observed by Hippocrates, Cassius, a contemporary of the first disciples of Asclepiades, and Aretaeus; and the accuracy of the observation has been in general confirmed by many modern observers. The reverse of this symptom, namely, palsy on the same side of the body in which was situate the disease or injury of the brain, had been noticed by Schlichting, Smetius, Rumler, Cabrol, Harder, and Bianchi, † the last of whom found the same side affected in disease, and especially abscess

* Dublin Hospital Reports, Vol. iv. Rostan, Obs. xxxvi. p. 143 et 237.

† Lettera, sopra un' Apostema del Cervelletto.

in the *cerebellum*. This is further confirmed by Borsieri, who refers to the same head the fact, that the muscles of the same side in which the lesion exists are, in certain cases, convulsed instead of being paralytic; and also the fact, that, in the same cerebral lesion, the alternate side is paralysed, and the side corresponding to that in which the lesion exists is convulsed. This, however, does not accord with general observation, nor is it quite consistent with the phenomena of mere cerebral inflammation. While Borsieri is correct in saying, that convulsive motions take place in the early stage when irritation predominates over compression, it must be observed, that, in cerebral inflammation, the members of the same side, which are at first the seat of rigidity or convulsive traction, became afterwards the seat of palsy. As, therefore, all facts concur in justifying the conclusion, that convulsive motions indicate a less complete extinction of the nervous influence than palsy, it is more rational to infer, that, in those cases in which, while one side is paralysed, the other is convulsed, the lesion is less serious on that side of the brain opposite to which convulsions take place, than in that opposite to which the members are paralysed, and, consequently, that they do not depend on the same lesion or lesion of the same side of the brain, but that, while the paralytic symptoms depend on considerable lesion of one side of the brain, the convulsive motions depend on slighter lesion of the other side.

The greater frequency of palsy of the side opposite to that of the diseased portion of brain than of that on the same side, has been also admitted and confirmed by Prochaska, who infers that, as in the former class of cases, the *corpus striatum* is uniformly the seat of disease, viz. sanguine infiltration or extravasation, softening, or other destruction, this peculiarity belongs chiefly to this part of the brain. It was, indeed, an opinion of Willis, that the *corpus striatum* regulates the motion of the alternate or opposite sides of the body to that on which it is situate, namely, that the right *corpus striatum* regulates the motions of the left side, and the left those of the right side; and this inference Prochaska is disposed to regard as possessing some degree of probability.*

The cause of this alternating influence Santorini imagined he

* Op. Minor. Observat. Patholog. sectio iv. p. 312. Viennæ, 1800.

had discovered in the decussating fibrous chords of the posterior pyramids or restiform processes with such certainty, as to exclude all doubt on the subject. The details of this decussating communication, which I have given in the Elements of General Anatomy, it is unnecessary here to repeat. It is sufficient to say, that the fact of the intercrossing or mutual decussation of the posterior strands of the *medulla oblongata*, has been generally regarded by the best anatomists as sufficient to account for the symptoms of decussating palsy; but the fact of palsy occurring on the same side with that of the lesion in the brain, it does not explain. Hence, in admitting the explanation of Santorini, as confirmed by the researches of modern anatomists, some authors, as Bouillaud, have entirely rejected the fact of palsy taking place on the same side of the body with that in which the cerebral lesion occurs.*

In those cases in which there is a lesion in each hemisphere, or in each *corpus striatum*, constituting what has been named *hemiparaplegia*, or what would more accurately be termed double *hemiplegia*, this is to be distinguished from *paraplegia* or transverse palsy, by the circumstance of the two sides being very seldom paralytic in equal degrees.

Diminution or abolition of the senses (*anaesthesia*,) or, as it is often named, palsy of the senses, if not previously evinced, generally appears along with or soon after palsy of the muscles, and it also is alternate. The pupil on the affected side, originally contracted, becomes dilated and immovable, and often the eye is contorted outwards. The patient becomes deaf, void of smell and taste, and gives no indication of the faculty of touch or tact.

When palsy is associated with *anaesthesia*, according to Bellingeri, these symptoms indicate the presence of lesion of the cerebral lobes, and commonly in those of the cerebellum. Paralytic resolution, on the other hand, or rigidity without perversion or abolition of sensation, indicates an affection of the cerebellic lobes.

Attempts have been further made to determine, by the kind and extent of the paralytic symptoms, the exact part of the brain which is the seat of disorder. Thus it appears, especially from the observations of Bouillaud, and, indeed, from various cases recorded by Rostan andALLEMAND, that lesion

* *Traité Clinique de l'Encephalite*, p. 262.

of the anterior cerebral lobes, in the manner either of inflammatory injection, sanguine, sero-sanguine, or purulent infiltration, or softening more or less complete, is attended with palsy of the organs of speech, viz. the tongue, lips, and the organs moving the teeth and mouth. Thus MM. Delaye, Foville, and Pinel-Grandchamp, have been led, by numerous observations on the phenomena and effects of cerebral inflammation on the human body, to infer, that in inflammatory injection and softening or destruction of the *corpus striatum*, and the medullary fibres, corresponding to it, or lesion of the middle lobes, the motions of the leg chiefly are disordered or destroyed; and that in inflammatory injection and destruction of the optic *thalamus*, and the white fibres attached to it, on the posterior lobes, the motions of the superior extremity are perverted or destroyed. In the same manner, where both the upper and lower extremity were either limited in motion, or quite paralytic, they have traced the injury to lesion of the optic *thalamus* and striated body of the same side, and where the loss of motion in the upper and lower extremity were unequal, they have also observed that the lesion in the optic *thalamus* and striated body was in like manner unequal. (Rostan, p. 250.)

e. When either muscular contraction takes place, or the patient ceases to have the power of moving the limbs at will, various derangements of the mental faculties are observed.

In the first place, the memory is more or less impaired, constituting *amnesia* in various degrees. It is common to perceive the patient to lose the recollection of proper names, appellatives, and even substantive nouns. Thus he remembers and recognizes the person and features of an intimate friend, but is unable to recall or pronounce the name, and in many instances, though he can remember any ordinary object, and show that he is aware of its characteristic properties, he is quite unable to pronounce the name of the object. This bereavement of the power of recollection, and perhaps of abstraction, as demonstrated by incapacity to remember substantives, and names of objects, was early noticed by Boerhaave,* Linnæus,† and Haller,‡ the latter of whom remarks, that it is the first privation, and takes place before that of arts, or the remembrance of the mental labours of the individual. It was afterwards observed by Per-

* Prælect. Acad. De Morbis Nervorum, p. 697.

† Svenska Wetensk. Handl. 1745, p. 116, 117.

‡ Elementa Physiolog. v. Lib. xvii. p. 540.

cival as accompanying certain varieties of palsy,* and doubtless this must have been connected with cerebral softening. From Cuvier, we learn that it took place in Broussonet, the eminent naturalist and agriculturist, in whom it seems to have been connected with the presence of an ulcerated portion of the left side of the brain, the effect of an apoplectic (hemorrhagic) attack. I have known it take place to such an extent, that the patient was quite unable to name any of the common articles or subjects of ordinary conversation. In some instances, as in the case of Brisson the naturalist, it proceeds so far that the individual forgets the words of his native language, and attempts to express himself in a confused and unintelligible patois, sometimes formed of words from different languages, sometimes formed of terms invented by himself.

A modification of this I consider what I have seen in certain cases of cerebral softening, viz. a particular lesion of the mental faculties, consisting in the loss of the power of recalling the proper word or words, and substituting others for them, and in certain circumstances a confused and faulty arrangement of the words. This took place in the case of a young woman of 22, who was under my care for several months in 1837, with symptoms of cerebral softening, giving rise to *hemiplegia* of the left side, and hesitating speech. When the paralytic symptoms were at their worst she altogether lost the power of giving utterance to her desires and wishes. As the paralytic symptoms began to diminish in the arm, she recovered the power of speech, but could not continue to speak consecutively, and repeated in a confused and indistinct manner the same words. She always said, "I am bettered," instead of "I am better." For rose, she said fose. Words beginning with S, she could rarely pronounce; and words of three syllables not at all. When requested lately to read a verse in the Scriptures, she could not pronounce the word salvation, but called it salvatation. Names of persons, also, she could not pronounce or remember, and is still unable to remember a verbal message delivered to her.

A similar instance of almost complete loss of verbal memory, or, as the author terms it, the memory of language, is recorded by Dr Shapter of Exeter to have taken place in the person of an Italian refugee, a man of considerable knowledge in literature and metaphysics, and perfect master of several languages.

* Works, Vol. ii. p. 73.

In this case, the lesion of memory was connected with general feebleness of the left side, though not amounting to palsy. The control over the motions of the tongue was much more completely destroyed, and he might be said for several days to be altogether void of the faculty of expressing himself. At this time, when he attempted very slowly to write down his wishes, he was quite unable to arrange the words in their proper order, or even to connect them so as to make a coherent sentence. This patient, like all the others, perfectly remembered facts, and could recall in pretty regular order the various transactions and adventures of his life.*

Another variety of this form of *amnesia*, or rather loss of the power of distinguishing words from each other, is that in which the patient either substitutes one word for another, or employs a term altogether improper or new. Thus in a case published by Martinet, in the *Revue Medicale*, 1824, when the patient was requested to say *tambour*, he uttered the word *po-mage*; a pen he called a cloth, a spit-box a pen, a hand a cup, and a cord a hand.

It has naturally been a question, both curious and important, to ascertain if there be any facts which are adequate to determine what is the part of the brain, the lesion of which gives rise to this singular loss of recollection. This question Bouillaud thinks he has furnished the means of answering, and he states that, in a great number of cases in which the loss or the confusion of speech, and privation of the memory of words, was the most remarkable symptom, he found upon inspecting the brain after death, a morbid change in the anterior part or lobe of the cerebral hemispheres.

It would be agreeable, at least, if not fortunate, if it could be said that this is a positive and constant conclusion. But to this character it is not yet entitled. Bouillaud does not well distinguish between the loss of speech depending on the palsy of the muscular organs subservient to that function, and that which is the result of the loss of memory, want of the faculty of distinguishing the differences of words, and inability to arrange the proper words in the proper order. The former symptom, viz. incapacity to speak by reason of imperfect control over the muscles of the tongue, I have no hesitation in ascribing to disorder affecting the origins of the hypoglossal or

* The Transactions of the Provincial Med. and Surg. Association, Vol. v. Lond. 1837, p. 313.

middle lingual nerve, viz. the twelfth cerebral nerve, the ninth of the old nomenclature, in the furrow between the olivary and pyramidal bodies, or in either of these bodies themselves; and this disorder may consist either in vascular congestion, inflammation, or any of its effects. This privation, however, Foville places in the lesion of the *Hippocampus major*. The second symptom, namely, inability to speak from inability to recall and select the proper terms, must depend on lesion of some part of the brain; but that this part cannot be the anterior lobes is, I think, proved by the fact, that in the case of a person of considerable eminence as a diplomatist and linguist, detailed in the Edinburgh Medical and Surgical Journal by Mr Craig,* though the loss of the memory of names was a prominent symptom, yet no lesion of the anterior lobes was found, and the principal morbid change was found in the posterior lobe of the left hemisphere. In the seventh case, also, related by Dr Bright, in which the confusion of terms and the substitution of one word for another was a prominent symptom, the lesion which corresponded to this disorder, was pulpy disorganization of the whole of the *corpus striatum* of the right hemisphere.† In the case of the young woman, already mentioned, as under my own care, I inferred that the cerebral lesion was situate in the portion of the right hemisphere occupied by the *corpus striatum* and the anterior part of the optic *thalamus*, because it was preceded by, and accompanied with, *hemiplegia* of the left arm, left side of the trunk, and the left leg. She has since recovered a certain degree of the use of the limbs and also of speech, but is still liable to arrange words in improper situations. It is quite possible, notwithstanding these facts, that the anterior or superior part, or both of the *corpus striatum*, may be the part of the brain the lesion or destruction of which is followed by diminution or privation of verbal memory; and if this be the case, it will reconcile the discordance between the inference deduced by Bouillaud from his cases and the opinion maintained by Dr Bright.

One circumstance relative to this bereavement I have yet to mention. Though, as has been observed by Percival, it occurs

* History of a Case of Spectral Illusions, &c. Edinburgh Medical and Surgical Journal, Vol. xlv. p. 334 and 362.

† Cases and Observations illustrative of Diagnosis where Tumours are situated at the base of the Brain, or where other parts of the Brain and Spinal Chord suffer lesion from Disease. Guy's Hospital Reports, Vol. ii. April 1837, p. 279 and 302.

along with palsy, yet it is occasionally observed to take place without this symptom. Thus, in the case recorded by Mr Craig, the voluntary motions were not affected; and in Dr Bright's eighth case, the second in which this phenomenon took place (Guy's Reports, p. 306), the only paralytic symptom was slight drawing of the mouth to the left side. I know also one case of this kind, in which the individual had lost entirely the recollection of proper names,—could not name a friend though he could easily recognize his person, could not recall the name of his own wife, and forgot every appellative except that of the firm of the house to which he belonged, yet had throughout no symptoms of paralytic loss of power. As the *corpus striatum* has always been known to be the seat of more or less congestion, suppurative destruction, or softening in these cases of palsy, it is manifest that in such cases as those now referred to, as there was no paralytic symptom, at least of the pelvic extremities, the circumstances preclude the possibility of inferring that the *amnesia verborum*, as it may be termed, is always connected with lesion in that part of the brain. I think, therefore, that we must infer that the privation is connected with lesion of a portion of brain, perhaps anterior and superior to that of the striated body; and that, when it is associated with *hemiplegia*, it is from the lesion extending from the striated body to the adjoining white matter.

It is proper to mention, however, that this bereavement of the remembrance of words and names is merely considered by Haller and Mr Stewart as the first indication and the slightest form of decaying memory, without referring it to lesion of any particular region of the brain.

A second mental disorder remarked in this disease is more or less diminution in the force and rapidity of apprehension. In the ordinary healthy state of the brain, by means of this faculty the individual comprehends propositions, statements, and questions, and is enabled to show, by his answers or remarks, that he understands them. But when the brain is the seat of injection, hemorrhage, softening, or sero-purulent or purulent infiltration, the faculty is in various degrees impaired, sometimes totally abolished. The individual neither understands statements made nor questions proposed; or understands them slowly and imperfectly, and answers confusedly, sometimes in such a manner as to show that he has not comprehended

the statement in question. When the faculty is not wholly abolished, it is either unusually slow or it is imperfect.

A third mental disorder observed in the course of this malady is that of the thinking and reasoning faculty. This may assume various forms. *First*, it may consist either in general confusion and disorder of all the thoughts, in which the faculty of arranging the ideas is more or less, sometimes completely, perverted. In some instances this want of the faculty of arranging ideas is connected with an incessant succession of them, in which they seem to pass through the mind with extreme and unusual rapidity. In either case the disorder is *delirium*. *Secondly*, the faculty of recalling ideas may be impaired; and as this depends partly on reminiscence, partly on imagination, wherever the former faculty is impaired, proportional derangement in the faculty generally takes place. *Thirdly*, the power of examining and comparing different ideas, and recognizing their similitudes or differences, may be either enfeebled, or perverted, or abolished. In the first case in which the judging faculty is enfeebled, the derangement may be termed imbecility, (*amentia*.) In the second, it constitutes mania or insanity. And, in the third, it forms fatuity.

Of these several forms of mental disorder different degrees take place in the different stages of cerebral inflammation and its effects.

Raving or *delirium*, that is confusion in thought, and incoherence in language, is not a constant or uniform symptom in cerebral inflammation or its effects. This symptom, indeed, belongs rather to meningeal than to cerebral inflammation; and hence it is observed to take place chiefly when the disease is seated towards or in the convoluted surface of the brain, and towards the close of the disorder, when it has either advanced to that surface by progressive extension, or is complicated with congestion or inflammation of the investing membranes. It is partly by observing facts of this kind that MM. Foville and Pinel Grandchamp are disposed to place the seat of intelligence in the cortical or convoluted part of the brain.

A much more common symptom is either imbecility (*Amentia*) or monomania, or mania, or fatuity; and of these, monomania or mania are rather less common than imbecility or fatuity.

Imbecility, indeed, in different degrees and forms, may be regarded as one of the most natural terminations of cerebral

inflammation, when it does not prove fatal. Whether the disease takes place in the young, the middle aged, or the aged ; whether it comes on spontaneously or be the result of external injury ; whether it be accompanied with palsy or without that symptom, almost invariably the individual betrays marks of feebleness of intellect, and incapacity of the faculty of thought and reasoning. The degree and the form of imbecility varies. In some cases it seems associated with, and dependent upon, the bereavement of memory already mentioned ; in others it is connected with loss of the faculty of recollecting ideas. In other cases it is connected with a general progressively increasing feebleness of all the mental faculties.

This imbecility approaches in two modes. First, it may come on with a general air of stupidity and listlessness, not dissimilar to that which is occasionally observed in typhoid fever. The patient does not readily or speedily comprehend questions, answers slowly and with doubt and hesitation, seems inclined to somnolence, does not manifest the influence of the usual animal appetites of hunger, thirst, heat, cold, comfort and discomfort, and is indifferent to the means of gratification. This increases, and generally passes by insensible shades to a state of stupor and coma.

In the second form of approach it succeeds the paralytic shock. Sometime after this occurrence, generally with imperfect speech, and always with more or less loss of memory both of words and things, and especially arts, the faculty of apprehension is observed to become slow, imperfect, and confused, that of attention is also weakened, and the power of comparison and reasoning is impaired and gradually abolished. As this change in the mental faculties takes place, the expression of the countenance becomes stupid, heavy, and monotonous ; the features are rarely moved ; the eye becomes listless and heavy ; and the whole aspect is at length fatuous. This state constitutes the *amentia* of Sauvages and Cullen.

In cases of this class the muscles of the mouth and pharynx becoming more or less paralytic, deglutition is in general performed slowly, imperfectly, and with difficulty. As the secretion of saliva proceeds, yet without the mouth being capable of retaining the fluid, or the patient swallowing it instinctively and almost without effort, as in health, it is allowed to escape from the mouth almost as rapidly as it is secreted.

The extinction of the mental faculties, with the paralytic con-

dition of the muscles of the mouth and pharynx now described, may be regarded as the consummation of this disorder, in which ensues the state so often observed in advanced age, and even sometimes in early or adult life, when man is reduced to the state of a helpless changeling or a drivelling idiot, (*amentia senilis*.)

Though this state is one form of that which has been described as senile fatuity, or the imbecility of old age, (*dementia senilis*,) (*amentia senilis*,) Sauvages and Cullen; yet its occurrence is not confined to the period of advanced life, but it may ensue at a much more early period, where the lesion of the brain is extensive, and especially when it occupies part of both hemispheres. The lesion may be such that it does not give rise to general palsy, but merely to fatuity, blindness, and deafness, with loss of speech.

In those instances in which palsy is either moderate or partial, life may be prolonged in the state of imbecility for months or years, chiefly because there is no lesion of the *crura* of the brain, the annular protuberance, or the middle and posterior lobes, or the bulb of the spinal chord, (*medulla oblongata*.) When these parts begin to be affected, the motions of the alimentary canal become disordered, with vomiting, diarrhoea, or both; the action of the respiratory muscles becomes feeble, languid, rapid, and at length panting; the cardiac beats frequent, feeble, and sometimes variable and irregular; and death ensues chiefly by a species of chronic asphyxia.

DURATION.—Nothing is more difficult than to fix exactly the average duration of this disorder. In the numerous cases collected by Rostan and Lallemand, it is quite clear that both of these authors have been mistaken with regard to the first commencement of the disease, and, consequently, have calculated the disease on erroneous data. Thus the former author allows that the invasion of the disease is often obscure, and the termination insensible and imperfectly defined; and he is in doubt whether to admit palsy to be the first symptom of the disease or not, and then allows the paralytic shock to be the indication of the establishment of the disorder. Lallemand, not very differently, gives, in a tabular view on this point, the number of 22 cases in which the patients died in the first week; and in three of these death was sudden, in three it was very quick, in three it took place on the second day, in four upon the third, and in three on the fourth day. It may

be safely asserted, that in not one of these cases was the first origin of the disease accurately ascertained.

I feel it equally impossible to admit on this point, the statements of Andral, who, though he allows that very few individuals die before the second day, yet adds, that the greatest number die between the second and the twelfth day. The whole of these authors, indeed, appear to me to have committed a fundamental error both in pathology and treatment, in regarding as a disease a morbid change which is the effect of a disease, or at least of a morbid process with characteristic symptomatic effects.

From the cases which have fallen under my own observation in this country, I am satisfied that palsy ought not to be viewed as the first symptom of the disorder. In all the cases of palsy taking place in this manner, I have ascertained that the loss of motion was invariably preceded for several days by headach, sometimes very intense, lasting for from five to seven or eight days; giddiness, confusion, and inability to walk with the wonted steadiness, or by some similar symptoms indicative of disorder in the cerebral circulation. As palsy, indeed, can only take place after part of the brain, generally the striated body and its attached fibres, has been very considerably injured, sometimes completely broken down, or at least after blood has been effused from a cluster of distended vessels, I do not perceive how that phenomenon can be regarded, consistently with correct pathological notions, as the first symptom of the disorder. In the only case in which it can with any plausibility be viewed as entitled to this character, that is, when extravasation of blood to an extent, limited or considerable, has taken place, this extravasation is always preceded, I have already shown, by congestion in a certain order or set of blood-vessels, in which the blood moves at first very slowly, then almost stagnates, then gives rise to separation into serous or sero-sanguine fluid; and sometimes of pure blood, with slight softening, which, however, gradually increases in degree and spreads in extent.

Another source of error in this matter is the fact, that in the cases which terminate most suddenly after the appearance of palsy, either the preliminary disorder in the cerebral capillary vessels has been subsisting for a considerable time, not unfrequently for one or two weeks, or the morbid injection and softening has taken place in a part, the integrity of which is

most essential to life. Thus in the case of a woman aged 34, recorded by Bricheteau, in whom loss of consciousness, sensation, speech, and general palsy were the apparent first symptoms of the disorder, and who died a day and a half, or about thirty-six hours after, the substance of the annular protuberance was found converted into a whitish semifluid pulp above, and a grayish softened pap below. In this case, however, while it is pathologically impossible that so great a change could have been effected within the space of thirty-six hours, the patient had not only been in precarious health, but she had suffered from pains in the head, which are called wandering, but which, doubtless, if due inquiry had been made, must have indicated the presence of disorder in the cerebral circulation.

To form, therefore, a just idea of the duration of this disease, it is requisite to add to the time at which the paralytic symptoms or those of rigidity appear, the whole of that previous time during which the patient has suffered pain in the head, giddiness, confusion, or other uneasy sensations about the head, or in the ears or eyes. In the shortest and most rapid cases, this will be at least five or seven days; and in other instances, it will amount to months and years. In one case, the subject of which I knew well, the symptoms of the disorder lasted for at least two years, during which it was opposed by treatment, medical and dietetic, but at last terminated in the usual manner. In another case the headach returned at intervals for several years, according to one statement ten years; and the usual loss of consciousness and motion, followed by *hemiplegia* depending on softening of the one hemisphere, at length took place, and terminated fatally in the course of about five months. The duration and course of the disease, after the appearance of symptoms of rigidity or palsy, will depend on the part of the brain affected, on the extent of the lesion, and on the treatment. According to Rostan, the space may vary from two or three days to two or three months. It may terminate fatally, according to him, on the 4th, the 5th, the 15th, or the 20th day; but, as he draws an analogy between this disease and peripneumony in this respect, I fear that these numbers are more in accordance with system than with the results of actual observation.

Among 41 cases recorded by Lallemand, he represents 22 to have died in the course of the first week, 12 in the course of the second, and 7 in the course of the third week. But I have already observed, that the whole of these calculations are

vitiated, by the imperfect information on the first commencement of the disorder.

On this point Andral states, that, among 105 subjects who presented symptoms of softening, there remained at the end of the first month more than 16 who survived it; after the second month more than 10; after the third month only 7 individuals survived; and of these, only 2 resisted this cerebral lesion for the space of three years.

By far the most rapid variety of cases is that in which the cerebral arteries are more or less generally steatomatous, ossified, brittle, and rigid. In this state the morbid action is of that kind, that the inflammatory stage is extremely short, while the greater part of a hemisphere is dissolved, as it were, in a diffuent creamy mass. It seems chiefly of this form of disorder that Rostan speaks, when he states that he has seen softening attack an entire lobe, and destroy the patient in the space of two days. But even in cases of this rapidity of progress, is M. Rostan quite sure that he could distinguish and fix with certainty the first commencement of the disorder? Is there not reason to believe, that, as he fixes his attention on the softened state alone, this must have been preceded by a previous state of obstructed circulation and injection in the vessels which terminated in the softening, the duration of which was so short before death?

PROGNOSIS.—The terminations of cerebral inflammation, whether acute, subacute, or chronic, may be understood from the history now given of the morbid changes and their concomitant symptoms. They may be enumerated in the following manner. Cerebral inflammation may terminate, *1st*, in resolution in favourable circumstances, and under prompt and active management; *2d*, in death; *3d*, in other disorders.

1. Resolution.—The termination in resolution is rare, and can only take place in very favourable circumstances, and under the most prompt and active treatment. The circumstances most favourable to this result are, the disease being recognized in its very commencement, that is, in the irritative stage, while pain of the head, vomiting, and slight pricking pains or cramps, or transitory contractions in the muscles only are felt; the youth of the patient, and the other organs, as the heart and arteries, being little affected by disease; and, *thirdly*, the immediate adoption of the antiphlogistic treatment in all its divisions, general and local, medical and dietetic. It is proper

to observe, that this mode of termination by resolution or in recovery is very generally regarded as impossible by Rostan, Bouillaud, and Andral. In this respect their views are correct, in so far as they apply to softening or pulpy destruction of the brain, viewed as a primary process, as no doubt can be entertained that, when a portion of brain is so destroyed, it cannot be restored; and if extensive, or situate in or near a part essential to the action of respiration and circulation, it will be followed by the fatal event in no long time.

To this, however, I have to say, that the softening or pulpy destruction of the brain must be regarded, both on the evidence of its anatomico-pathological characters and on that of its semiographical history, as the effect or consequence of a previous state of inflammation, or inflammatory or hemorrhagic congestion. In the first stage, various facts show that the disease is susceptible of terminating without inducing palsy, or that degree of destruction of the brain which must terminate fatally. In the second stage, when inflammation has proceeded to softening, the occurrence of the fatal termination will depend upon the seat of the destruction, and the extent to which the part affected has been disorganized. In short, it must be admitted as a pathological principle, that cerebral inflammation or congestion is susceptible of recovery; but that the destructive softening in which it terminates, is more frequently followed either by other maladies or the fatal event.

Lallemand, accordingly, is disposed to believe in the possibility of termination by resolution, and adduces in confirmation of this view, several cases, in which he infers from the symptoms, that the disease existed, but subsided under suitable remedies, chiefly of the antiphlogistic class. (*Lettre seconde*, p. 288—322.) Rostan, in the last edition of his work, published since he has seen these cases, though he maintains that they are not conclusive, and by no means calculated to make him change his opinion as to the non-inflammatory character of the disorder, admits, however, that he has seen the symptoms of the first stage disappear; but he adds, that, as these might have been merely dependent on simple congestion, and as they are always doubtful when the symptoms of the second stage, that is, of actual softening, do not appear, he declines drawing from them any conclusions, further than that cases in which the symptoms of that stage disappear under treatment can only lead the attendant to suspect the existence of resolution.

The only mode of determining this question is by distinguishing the disease, as I have done, into the irritative or congestive stage, and the softening, or infiltrating, or suppurative stage. If the disease be opposed by suitable remedies in the early stage, then it may terminate in resolution, or, at least, without going on to such destruction of the organ as to induce the fatal event.

2. It cannot, however, be denied that the natural tendency of cerebral inflammation is to death. This fact is sufficiently proved by the large proportion of cases which terminate fatally under every mode of treatment. All the cases detailed by M. Rostan, amounting to 40, terminated fatally, except one, which he regarded as doubtfully belonging to the early or congestive stage of the disorder.

3. When cerebral inflammation terminates neither in immediate recovery nor in death, it then terminates in several other modes.

a. It may terminate in effusion of lymph, or rather sero-albuminous fluid, in which there is an effort to limit the inflammatory process in the manner already described. So far as is known this termination takes place in the following manner. When part of the brain, for instance, the striated body (*corpus striatum*) of one side, or that and the adjoining portion of the hemisphere, becomes the seat of capillary congestion and inflammatory injection, when this does not, under the prompt and seasonable use of proper remedies, subside spontaneously, serous, sero-albuminous, or sero-sanguine fluid is gradually infiltrated into it, and necessarily separates its parts, globules or fibres, destroys their cohesion, and consequently softens it. This state of the vessels, however, and its effects, are not in all points of the diseased portion the same in degree; and in several points, sometimes two, three, or more, the infiltration and the separation and destruction are more complete than in the rest. Part even of the congested or reddened and vascular portion may be less injected than the rest, and there is always a portion of a part affected with this phlegmasial injection, which, bordering on, and conterminous with, the sound part of the organ, may be so little irritated by the overloaded state of the blood-vessels as to be quite capable of retaining its structure and recovering its functions. While, therefore, one or two, or even more spots of the whole inject-

ed region becomes softened, the process is stopped at the margins of these spots ; and morbid action in the meantime proceeds no farther.

In the meantime the symptoms either greatly abate or altogether disappear. If the disease have caused the production of palsy of one side, the power of moving the limbs is partially recovered either in one or both limbs ; or in one limb motion is altogether recovered, and the other remains some time contracted, but still capable of performing many of the functions of a member. The speech is also in a great degree restored ; and the patient even may recover a certain degree of the faculty of attention and memory. In general, however, there remains either *hemiplegia*, or a certain degree of stiffness and rigidity in one or both members, with imperfect command over them.

In cases of this order, it is known from the history of their subsequent course and final termination, that, in the part of the brain originally affected, one or more cavities are left, containing serous, sero-albuminous, or yellow-coloured sero-sanguine fluid ; in some instances a yellowish substance like beeswax ; while the walls of these cavities are soft, irregular, and porous, and in some cases lined by an adventitious membrane ; that the surrounding portion of the brain, though not altogether sound, is still very nearly so ; and that these cavities are the remains of the spots in which softening had been produced by the infiltration from the phlegmasial injection.

In this class of cases the disease may be said to terminate in *hemiplegia* or hemiplegic contraction in different degrees ; but it must not be forgotten that this is only a single symptom of a lesion of the brain, which is the proper termination of the disorder.

b. Cerebral inflammation may also terminate in *hemiplegia* or lateral palsy, with general mental imbecility, or with monomania or mania. It is not easy to specify accurately the kind or degree of cerebral lesion in this order of cases ; for they are often very much the same as those in the last mentioned mode of termination ; and when they differ, it is chiefly by the extent or amount of anatomical lesion. In this mode of termination the memory is more seriously and generally impaired ; the faculty of attention is also so much injured that the individual is incapable of pursuing a train of thought or even follow-

ing any detail of facts, however short; and the reasoning faculty is generally enfeebled.

c. Induration, (*Sclerencephalia*.) In considering the state of the brain after the disappearance of the symptoms of cerebral inflammation, Lallemand thinks that he is justified, by various facts, in establishing the inference that the process may terminate in circumscribed induration. In one case which took place in a girl of 14, who had incomplete *hemiplegia* of the *right* side, part of the medullary substance of the *left* ventricle, about one inch and a half long, one inch broad, and from two to three lines thick, was so much hardened that it grated under the knife, and resembled Gruyere cheese. In another case of a man of 55, in which frontal headach, slight paralytic symptoms, and loss of speech, were followed at the end of fifty days by death, the gray matter of the convoluted surface adhered to the membranes, and was indurated like gristle, while the rest of the white or medullary matter was softened. In the first case he infers that the induration was the consequence of inflammation, because, four months previously, paralytic symptoms on the right side took place, and there was neither cyst nor reddened streaks in the brain indicating any effusion of blood or any softening; and, in the second case, he thinks that the hardness proceeded from the same cause, because the membranes adhered to the surface of the brain, and presented marks of inflammation.

These cases resemble the one already described, as seen by myself, in the circumstance, that the induration was partial, and in one of the cases, that it was associated with softening.

Rostan tells us that he has often met with cases in which the substance of the brain was much indurated and tough, so as to resemble wax slightly softened in warm water; but he is uncertain whether these effects ought to be regarded as the results of mollescence of the brain or not. He allows, however, that, in other tissues, induration is a frequent result of inflammation.

After giving the matter some consideration, and comparing this change with another soon to be noticed, in which the induration is not partial but general, it appears to me that the induration cannot justly be regarded as the effect of the softening, but it may be regarded as the effect of inflammation of the cerebral tissue of a peculiar kind. This is another bad effect of the method adopted by Rostan and others, of regarding sof-

tening of the brain as a primary lesion, when it is doubtless to be viewed as a consequence of inflammatory action. These partial indurations of the brain may be the effect of one kind of inflammation, probably the chronic; as softening is that of the acute or subacute forms of the process.

d. Lastly, cerebral inflammation may terminate in atrophy, and then the patient is in general imbecile and paralytic; and very generally the paralytic member becomes shrunk and insensible, or, in short, atrophied. Thus Rostan gives from M. Foville the case of a woman of 60, in whom the right arm had been in a state of atrophy from the age of 15 or 16, at which time she was attacked by convulsions, after which the right arm became first paralytic and then atrophied, yet without loss of sensibility. After death, which took place in consequence of pectoral disorder, the posterior lobe of the left hemisphere was found almost gone; and the posterior part of the lateral ventricle, covered by a false membrane, was beheld through the arachnoid membrane; and around this loss of substance the convolutions were small, shrivelled, and attenuated. This must have been the effect of inflammation of the posterior lobe in early life.

ETIOLOGY.—Nothing is more difficult than to determine the nature of the circumstances on which the developement of cerebral inflammation depends. The circumstances which act as causes may be distinguished into two great orders; the first that of predisposing causes, and the second that of exciting or determining causes.

Among the former may be ranked middle or advanced age, hereditary tendency to cerebral disorders, the presence of certain diseases of the heart, as hypertrophy of the left ventricle, ossification of the mitral valve, and contraction of its aperture, the presence of disease of the arterial system, as steatomatous degeneration or ossification of the semilunar aortic valves, steatomatous or osteo-steatomatous disease of the aorta, its arch, or its descending portion, and steatomatous or osteo-steatomatous rigidity of the carotid and vertebral arteries and their branches, otorrhœa or chronic *tympanitis*, the presence of tumours in the brain, the habitual and excessive use of fermented, vinous and spirituous liquors, the indulgence of the passions, and the operation of the depressing emotions.

Age.—Rostan states that he has seen this disease only among aged persons, and he met with only a single case of the dis-

ease in a person of 30 years; and that, as he was not allowed to inspect the body, he thinks may be regarded as nothing. Among 39 cases in which Lallemand had an opportunity of ascertaining the ages he found the following numbers under each.

Between 10 and 20 years,	1 case.
20 and 30 -	7
30 and 40 -	4
40 and 50 -	4
50 and 60 -	10
60 and 70 -	6
70 and 80 -	5
Beyond 80 -	2

By combining the cases of M. Rostan with those now mentioned, 10 in the work of M. Bouillaud, 33 of his own, and 45 from various sources, amounting to 153 cases, M. Andral has compiled the following tabular view of the distribution of the disease over different periods of life.

<i>Years.</i>	<i>Cases.</i>	<i>Years.</i>	<i>Cases.</i>
Between 15 and 20 -	10	Between 55 and 60 -	18
30 and 25 -	9	60 and 65 -	8
25 and 30 -	9	65 and 70 -	26
30 and 35 -	6	70 and 75 -	69
35 and 40 -	5	75 and 80 -	11
40 and 45 -	9	at 81 -	2
45 and 50 -	10	at 87 -	1
50 and 55 -	9	at 89 -	1

This table, which is much more extensive than the last, alters in some degree the distribution of the ages. Thus, while in the table from the work of M. Lallemand only one in 39 cases is found between the ages of 10 and 20, between these ages in the latter table there are 10 cases, which is equivalent to one in $15\frac{1}{3}$. Again, in the table of M. Lallemand, before the age of 40 there are 12 cases, or 1 in $3\frac{1}{3}$; and in the latter table there are 39 cases in 153, which is equivalent to 1 in 4. Between 40 and 65 are 54 cases, or more than one-third of the whole amount; and between 65 and 80 the number increases greatly, being 56, or as many in the latter period of *fifteen* years as in the previous one of *twenty-five*. Beyond 80 the disease is not very frequent, for the obvious reason, that so many persons have, previous to that age, yielded to its fatality.

Sex.—On the subject of sex it is impossible to establish any positive conclusions. As the whole of the cases recorded by Rostan occurred among the inhabitants of an hospital appropriated to aged females, these must be thrown aside in the estimate. In 116 cases, published by different authors, in which the sex was distinguished, 47 were males, and 69 were females. In the Royal Infirmary in this city females are more frequently the subject of the disease than males.

Hereditary and Family Diathesis.—It is well ascertained that in certain individuals, and especially in the members of certain families, a disposition to the formation of cerebral or meningeal disease, or of both, exists. Thus in individuals and families of gouty disposition, in some it appears in the form of *meningitis* or *arachnitis*, in others in the form of mental derangement, in others in the form of cerebral inflammation and softening with palsy, and in others in the form of apoplexy. I have known one member of the same family present symptoms of palsy or paraplegia, another destroyed by meningeal inflammation, and a third present symptoms of meningeal derangement. This concurrence of the same or analogous kinds of morbid action has been by some explained by referring it to the operation of the strumous diathesis. As, however, it is most frequently observed in persons and families who have for several generations been either in easy or affluent circumstances, it seems much more rational to ascribe it to the full and sometimes the abundant mode of living, with deficient exercise, in which the members of such families generally indulge. It cannot be doubted that the parents may in such circumstances transmit to their offspring the disposition to cerebral and meningeal disorder; and it is observed that the offspring of such persons and families are in early life liable to various meningeal disorders. It is in such individuals that the marks or symptoms of what is called cerebral congestion are usually observed.

Cardiac Disease.—Hypertrophy of the left ventricle is a disease not uncommonly found in the bodies of those attacked by cerebral inflammation and softening. This lesion was observed in 14 among 26 cases of M. Rostan, in which the state of the heart was remarked; in two of those of M. Lallemand, and in three of the cases given by M. Bouillaud. In two of the cases given by M. Rostan there were the remains of pericardial in-

flammation. In one case given by M. Rostan, (20th,) the heart was atrophied, and its walls were lacerable.

Another morbid state of the organs of circulation is that of ossification either of the aortic valves, or of the aorta, or of the arterial system, especially that of the brain. In nine of the cases in which M. Rostan noticed the state of the heart and arterial system, the aorta or its valves were ossified. In two the aortic aperture was contracted.

The co-existence of various diseases of the heart, especially hypertrophy of the left ventricle, ossification of the mitral or aortic valves, and contractions of their apertures, with diseases of the brain, has been observed for a long time by various pathologists; and the influence of the former order of maladies over the latter has been also attempted to be shown. In 1822, I attempted to show how the existence especially of degeneration of the mitral valve, and contraction of its aperture operates in inducing capillary congestion and disease in the brain, (*Edin. Med. and Surg. Journal*, Vol. xix. p. 63); and the subject has since been fully examined by Bricheteau and Bouillaud, especially in reference to the influence of hypertrophy of the left ventricle. Though these two diseases operate, in some respects, in different modes, they tend ultimately to produce the same fulness and overloaded state of the venous circulation, and consequently of the capillary system, and thereby excessive congestion of the meningeal and cerebral circulation.

Hypertrophy of the left ventricle acts in two modes. It propels the blood with unnatural and excessive violence into the arterial system, and especially into that of the head and brain; and as the left ventricle is always in a highly distended state, the blood is accumulated in the left auricle, the pulmonary veins, the pulmonary capillary system, the pulmonary artery, and the whole venous system. Hence fulness at once of the arteries and the veins of the brain is induced, and extreme congestion of the whole intermediate capillary system.

Ossification of the mitral or aortic valves, and contraction of their apertures, operates in a different manner. As the blood is not allowed to issue from the left ventricle and auricle with the requisite facility, these chambers are kept in a state of constant over-distension; and the result is, that the pulmonary veins, the pulmonary capillary system, and the pulmonary artery, are kept in a state of constant distension with blood,

which is not permitted to move through them with the requisite facility and velocity. Hence the whole of the venous system, and especially the venous system of the brain, becomes distended and overloaded with a mass of slowly moving blood, which is also imperfectly oxygenized.

These lesions of the heart form the true causes of the venous plethora which was employed so ingeniously by Cullen to explain the occurrence of venous hemorrhages taking place in the decline of life, and especially the congestive and hemorrhagic state, inducing apoplexy and palsy in advanced age. The venous plethora may be always traced either to concentric hypertrophy of the left ventricle, or to excentric hypertrophy, that is, dilatation of that ventricle, or atrophy of the ventricle, or contraction of the auriculo-ventricular or aortic aperture, from ossification and coarctation of their valves, or shortening of their tendinous chords.

By far the most certain predisposing cause to cerebral softening, inflammatory or hemorrhagic, is that diseased state of the cerebral arteries in which their tunics become penetrated by steatomatous or osteo-steatomatous matter, diminishing or destroying their elasticity, rendering them rigid, brittle, and friable, and thereby disposing them to congestion and rupture. This steatomatous or osteo-steatomatous degeneration may affect the internal carotids or the vertebral arteries or both, the circle of Willis, or any of its branches, especially the Sylvian artery. Sometimes it appears in pale patches, as when it is merely a steatomatous degeneration of the artery. When it is ossific, it assumes in general the appearance of rings, and makes the arterial tubes appear as if they consisted of a series of rings. This change has been ascribed by Serres and Bouillaud to inflammation of the arterial tissue.

When the arteries are thus degenerated, they become so rigid, and in some instances impermeable at their smaller branches, that they do not yield, as in the healthy state, to the distensive impulse of the blood, nor do they contract again as they do when still elastic. The result is, the motion of the blood is impeded; several of them become much distended; and as this impeded motion and distension continues and increases, hemorrhagic injection is established; and as the vessels are unusually brittle, they under this excessive distension often give way.

Influence of fermented and spirituous Liquors.—It has long been observed, that the habitual and intemperate use of ferment-

ed and spirituous liquors is, in many cases, followed by cerebral or meningeal inflammation, or both. It is unnecessary to inquire into the details of the mode in which these agents operate. The fact may be regarded as well established by numerous examples, and cannot be invalidated by the small number of cases in which the habitual use of these stimulants appears, not to be followed by cerebral disease. It is only requisite to add, that, as the use of spirituous liquors is known to accelerate the formation of steatomatous and osteo-steatomatous disease of the arterial tubes, the operation of these agents may in some degree be referable to the same head as the last. It would be unreasonable to doubt that old age itself, during which the arterial tubes become more or less hard, rigid, and brittle, has a natural tendency to derange the circulation through them. But it is also known that the habitual and excessive use of these liquors tends powerfully to accelerate this disposition, and renders the arterial tubes rigid and brittle at a much earlier period than they would become so, in the ordinary course of nature. In other respects, both spirituous and fermented liquors act on the cerebro-meningeal circulation, by retarding the motion of the blood, and thereby maintaining constant undue distension.

Little doubt can be entertained that all the passions act energetically in augmenting congestion towards the brain. This they sometimes do by acting on the heart, and sometimes by acting on the brain, sometimes by acting on both organs at once. The passions believed most hurtful are anger, love, indignation, and those with similar effects. The sexual passion and its frequent indulgence are allowed to be highly detrimental in the same manner.

All observers also have assigned great influence to the depressing emotions, and their operation in this manner may be daily observed. To this class belong anxiety, grief, and the disappointment of hopes, especially if long deferred. The effect of these feelings would, as Lallemand observes, be more frequently remarked; but numerous circumstances prevent the truth from being known, as the facts are studiously concealed by patients. (*Lettre ii. p. 225.*)

Lastly, disease, that is suppuration or chronic inflammation of the tympanal cavity of the ear, and the presence of tubercles or other tumours of the brain or its membranes, must be regarded as disposing causes.

Of the first I shall have occasion to speak afterwards, as a

cause very efficient, under certain circumstances, in inducing cerebral inflammation. Tubercles, tumours, and other new growths, whether analogous, or heterologous, almost invariably induce, by their irritation, cerebral inflammation and softening previous to the fatal event. The surrounding portion of the brain is more or less diffuent and disorganized.

Though it is not always possible to specify accurately the exciting causes of cerebral inflammation, the most usual are the following. External violence, such as blows or falls on the head, insolation or exposure to considerable or intense solar heat, exposure to cold under certain circumstances, especially currents of cold air on the head, great mental exertion, especially if prolonged, and uninterrupted by sleep, excess in the pleasures of the table, especially in warm apartments, wounds or ligatures of nerves, ligatures of arteries, especially the carotid, the action of the irritant poisons, as strychnia, inflammation in a diseased tympanal-cavity, and the presence of tubercles, tumours, or other new morbid growths.

Several of these circumstances require, perhaps, particular notice.

It may seem singular that ligature of a nerve should be followed by cerebral inflammation. In M. Lallemand's work, (*Lettre* ii. p. 123,) is recorded the case of a soldier of 38 years, in whom a ligature was applied round the right subclavian artery, for the removal of a traumatic aneurism of the axillary artery. In the ligature were accidentally enclosed with the artery the branches of the brachial plexus proceeding from the third cervical nerves. The result was fatal in the course of eight days, by softening and suppuration of the posterior extremity of the left hemisphere of the brain.

Cases in which symptoms of cerebral congestion and inflammation ensued after the enclosure of the carotid artery in a ligature have occurred to Mr Abernethy, * Sir Astley Cooper, † Professor Barovero, ‡ and M. Magendie. § It is certainly possible, from the facts mentioned by Lallemand, that several nerves may have been enclosed in the ligature along with the artery.

It is a curious and important circumstance to be observed,

* *Surgical Observations*, by John Abernethy, F. R. S., London, 1804, p. 193-207.

† *Medico-Chirurgical Transactions*, Vol. i. p. 1. London, 1812.

‡ *Journal de Physiologie*. § *Ibid*.

that the use of strychnia seems, in certain circumstances, to be followed by cerebral injection, hemorrhage, and inflammation and its characteristic effects. It is well known that the physiological effects of this substance, taken in a proper dose, are, some time after, rigidity of the limbs, spasmodic contractions, and violent convulsive shocks, which, though usually ceasing in the space of an hour or two, sometimes continue obstinately, and are aggravated and followed by death. Of this fatal result Lallemand states that he witnessed two instances; and in each case, on inspecting the brain, he found the cerebral substance surrounding the clot destroyed, and for a considerable space soft and diffuent. (*Lettre ii. p. 267.*) It is probable that the cases to which Lallemand alludes are the same as are represented by Bouillaud to have taken place at the Cochin Hospital in August 1823, (Cases 12 and 13,) when the practice of administering this alkaloid in apoplectic and paralytic affections was in full fashion. In the first of these cases, which took place in a woman of 57, attacked with apoplexy, strychnia was given on the 10th day of the disease, in the dose of one quarter of a grain, afterwards between the 14th and 20th days, in one-half of a grain, and finally between the 20th and 23d, when it was stopped, in the dose of one grain. The characteristic shocks were not induced; but in the brain after death were found clots of blood surrounded by soft diffuent brain in the right striated body, and adjoining part of the hemisphere. In the second case, (No. 13,) a woman of 50, with palsy of the right arm, was treated with this substance; and after two grains were taken, the face became vividly flushed, she lost the power of speech, and became insensible, and died comatose with stertorous breathing next morning. A considerable apoplectic cyst, surrounded by softened diffuent brain, was found in the middle of the upper part of the left hemisphere.

It is extremely difficult to say whether, in these cases, the strychnia was in any manner connected with the bloody congestion, effusion, and softening, or not. But both Lallemand and Bouillaud are of opinion that the drug might have contributed to the production of the cerebral inflammation. (*Bouillaud, p. 309.*)

Cerebral inflammation, whether in the form of softening, or purulent infiltration, or abscess, is observed to be complicated with morbid lesions of various other organs. To those of the heart I have already adverted as disposing causes. But it is im-

possible to assign with certainty the same rank to various affections of the lungs, the liver, and the alimentary canal. Thus it is not very uncommon to find in the bodies of those destroyed by cerebral inflammation, the lungs presenting marks of inflammation in various stages, sometimes the second, sometimes complete hepatization. One or other of these changes were found in nine of 26 cases, in which Rostan remarked the state of the lungs; and in many of the residue slighter forms of disease of the lungs were found. In the cases given by Bouillaud also are found nearly two-thirds with various disorders of the lungs. In the instance of suppurative inflammation of the brain which occurred to myself, the patient was admitted for symptoms of pneumonia, which terminated in gangrene of the lungs. Though it would be rash to draw from a single case general conclusions, it is important to remark this connection, in order to determine subsequently whether it be accidental or essential.

In the alimentary canal it is not unusual to find various marks of chronic inflammation. The existence of these I have already attempted to explain.

Varieties influenced by the nature of the exciting cause.—Though the exciting causes, however different, are followed by much the same morbid action, yet it may render the account more complete, if I direct the attention of the practitioner to two forms of the disease in which some peculiarities are observed, and in which there is, generally speaking, greater room for active treatment than in the other forms of the disorder. The two varieties to which I refer are inflammation ensuing upon acute or chronic inflammation of the tympanal cavity, and that following external violence. These agree in the circumstance, that the inflammatory action is not confined to the brain, but affects at the same time the brain and its membranous investments.

A. Cerebro-Meningeal Inflammation connected with or ensuing on inflammation and suppuration of the external Ear-hole, and the Tympanum.—When inflammation affects the tympanal cavity, whether it have commenced there, or in the *meatus externus*, it is liable to pass backwards into the cells of the mastoid process, and forwards and inwards into the labyrinth. This may take place either in the course of inflammation of the tympanal cavity, or after it has subsisted for some time, and passed from the acute into the chronic stage, while puriform discharge from the mea-

tus, with more or less deafness or perverted hearing, are the chief symptoms.

In general the first approaches of the disease appear after exposure to cold, for instance a current of cold air, or travelling either with a cold wind blowing in the face, or on the lateral regions of the head. The first symptoms are cessation of the puriform discharge, pain, dryness and itching in the ear, complete deafness, great pain in the temporal and auricular region of the head, extending to the frontal and occipital regions, and sometimes all round the head, and not unfrequently delirium and stupor. The pulse is rapid, full and tense, from 100 to 120, the skin is dry, the face at first pale, afterwards flushed, and the tongue more or less furred. In general sleep is completely interrupted at first by the intense severity of the pain, which is always aggravated when the patient places his head on the pillow, and is often accompanied with a sense of heat and throbbing in that part of the head, and as it were within the scull. All noise and sounds are extremely painful, and the patient in general shuns light and prefers quiet. These symptoms rarely continue above twenty or twenty-four hours in any degree of intensity, without being accompanied with delirium; and if therapeutic measures be not promptly adopted, this is succeeded by stupor, spasmodic motions about the face and eyes, and at length coma; the pulse becomes very quick, small, and irregular; the face continuing flushed, the head and neck is covered with perspiration in drops; and either, with or without convulsions, the patient dies in a state of complete coma.

Though the appearances after death vary in different cases, the following may be mentioned as the most constant. The *dura mater* over the petrous portion of the temporal bone is thick, pulpy, and in general easily detached from the bone. Purulent matter, lymph, and blood in streaks or patches are found between the *dura mater* and the bone; and not uncommonly a layer of purulent lymph is found spread over the arachnoid surface of the *dura mater* of the spheno-temporal *fossa* and the *tentorium*, and over the corresponding portion of the arachnoid membrane. The middle lobe, or, to speak more accurately, the anterior part of the posterior lobe which lies in the spheno-temporal *fossa*, is more or less softened; purulent matter is spread over its convolutions, and is sometimes collected in its interior in an abscess. Purulent matter in general extends

backwards over the posterior lobe, and between that and the *tentorium*, and is also deposited over the anterior edge and the superior surface of the *cerebellum*, in which also sero-purulent infiltration takes place, or matter is formed in an abscess. In the cases of this form of cerebral inflammation the parts of the brain or *cerebellum*, which are softened, are not unfrequently of a greenish tint, sometimes light green, verging on yellow, in other instances dark green, and emit a fetid odour. The portion of brain thus changed may be regarded as affected with gangrene. In some instances of this disease also, inflammatory action attacks the sinuses, renders them thick and rigid, and causes the secretion of lymph and purulent matter in the interior of the venous canals. In an interesting case of this kind which occurred in the practice of Dr Stark of this city, inflammation had attacked not only the petrous portion of the temporal bone and the *dura mater*, and the brain, but spread into the lateral sinus in the *foramen lacerum*, spread downwards through the right jugular vein as far as its union with the subclavian, and upwards within the head through the right lateral sinus, as far as the *Torcular Herophili*, and the internal spine of the occipital bone, rendering the whole vessel thick and rigid, and lining its interior with lymph, purulent matter, and clots of blood; and the corresponding surfaces of the brain and *cerebellum* were of a green colour, much softened, and emitted a very fetid odour.

Encephalo-meningitis traumatica.—Inflammation of the brain ensuing more or less immediately upon external violence applied to the head, either directly or indirectly, presents so many peculiarities, that it requires a separate notice, however short and cursory.

Violence may be applied to the head either directly, as by heavy bodies falling on the head, or by blows on the head, or by falls in which the head strikes on hard bodies,—or indirectly, as in the case of falls from a considerable height, when the body alights either on the breech, or the lower extremities, in which a shock more or less violent is inflicted on the whole frame, and in which the skull and its contents partake in the effects of the concussion; or along with this, violence is inflicted on the head by falling on the lower jaw.

In both cases the first and immediate effects are concussion, or a degree of impulse inflicted on the brain sufficient to render

it unfit for the performance of its usual functions. When the effects of violence on the cranium are considered and analysed, it is manifest that they are divisible into two sorts, mechanical and physiological.

The mechanical effects consist in the tendency communicated to the whole of the atoms and particles to onward motion, in lines more or less straight, from the point of impulse, while they are restrained from obeying this impulse by their intimate union with contiguous particles. The immediate effect of this is in all cases a sort of vibratory motion or oscillation, between the onward impulsive tendency on the one hand, and the restraining retention on the other, which continues for some time after the impulse, until it subsides to the state of previous quiescence; and in some instances this onward impulse, or the consequent vibration, may be so considerable as to destroy the connection of the atoms in the immediate line of the impulse with the collateral and connected atoms. In the latter case, either the membranes and the brain may be forcibly detached from the skull, or the brain itself may be lacerated, with more or less rupture of vessels and effusion of blood. In this case these effects may be so considerable as to suspend the functions of the brain, and consequently to induce immediate death; and obvious marks of violence, in the form of detachment of the membranes, with or without fracture; rupture of blood-vessels and hemorrhage, or laceration of the brain with hemorrhage, are recognized upon inspecting the interior of the skull after death. These are mere mechanical effects; and time is not allowed for any physiological or pathological effects to ensue.

In those instances, however, in which life is not instantly extinguished, inflammatory action is established, and sometimes proceeds to softening or to suppuration.

In one class of cases, however, in which the impulse, though violent, had not produced either fracture of the bones, detachment of the membranes, rupture of blood-vessels, or laceration of the brain, the mere shock or concussion may, nevertheless, be either so violent as to extinguish life immediately, or, without doing this, it may suspend the functions of the organ for some time. The individual lies in a state of unconsciousness, with loss of motion and sensation, or moans, groans, and cries inarticulately, has spasmodic motions of the face and extremities, and even of the trunk, or may be for some time senseless and mo-

tionless, and at length slowly recover his recollection and powers of sensation and motion.

In this class of cases, the traces of mechanical injury are not observable after death. But though not cognizable, they are inferred to have taken place by the indications of the suspension or disorder of the cerebral functions immediately after the injury. These consist chiefly in such an impulse being communicated to the brain, as to throw the particles on the line of the force into a state of vibration or alternate contraction and relaxation, such that the proper functions of the organ are for the time deranged or suspended.

The fact of these vibrations taking place in consequence of impulse communicated to the cranium has been long known, and may be demonstrated experimentally as was done by M. Gama. He arranged in a white glass globe, or spherical retort, several threads in different directions; and he then filled the globe with a solution of isinglass, sufficiently strong to possess, when cooled, the consistence of the brain. After cooling, he closed the neck of the retort, and he struck the vessel with an ascertained degree of force at all the parts where this was practicable,—using sometimes the hand, sometimes different bodies. Blows at the circumference of the globe showed that the mass of jelly was agitated at all points in proportion to the force communicated to it; and of the movements taking place in the transparent mass, the vibrations of the threads gave information.

The effect of a moderate blow is always very obvious at the corresponding place between the glass and the jelly, and extends to some little distance. It is seen, also, that the vibration is communicated in the direction of the impulse and diminishes gradually, and is lost in the remote points, without the possibility of being followed. By striking more strongly, the mass is for an instant detached from the vessel under the point of percussion, at the same time that a like effect is observed at the opposite point of the diameter. It is in some degree made to recoil on itself, to form instantly the interval now mentioned, and which is easily recognized at the two sides of the vessel; then it resumes its first position, without showing whether this detachment is repeated in a more feeble manner. This sort of double impulse directs, consequently, the shock to the centre of the jelly in two opposite directions; and thence, according to the laws of repulsion, it is reflected to the circumference. The threads which

had obeyed the two impulses, that is, which had been carried inwards on both sides, vibrate then in a contrary direction. They assume their irregular movements, which continue some time, but in a direction no longer appreciable. It is impossible to recognize the vibrations of the globe itself under any blow, either by the eye or by the hand, whatever attention is employed.

From these experiments an exact idea may be formed of what takes place within the head, in consequence of a direct blow which produces concussion of the brain, in so far, chiefly, as the opposite point of the diameter of the place struck shall be on the spherical surface of the skull. If, for, instance the blow falls on the upper region of the head, the effect will no longer be the same. The brain will be detached from the skull, only under the point of percussion, and the base of this cavity will sustain a sort of disseminated counterstroke, in consequence of the extent which it presents. From this experiment, it appears that the communication of motion, which causes a direct concussion, exerts its first effect from without inwards, on one or on two points, according to the force of percussion. It follows that the cerebral mass contracts on itself, either from the place struck only, or at the same time from the place and the point opposite to it. The secondary effects of the repulsive vibrations are subordinate to the first.

When the retort is held reversed, that is, with its neck downwards, and the globe upwards, and if the extremity of the neck be struck with the hand or any covered resisting body, as if to impel more deeply the cork in its neck, or if the cork itself be struck, the threads are observed to vibrate from within outwards, or in the direction opposite to that in the first experiment. The motion is not more evident at this place than on any other point of the circumference; it appears to be diffused uniformly from the centre to the circumference of the jelly-like mass, though the percussion is as energetic as possible. The vibrations of the threads show, nevertheless, as a secondary effect, that this motion is then transmitted from the circumference to the centre, but not very sensibly, and it is requisite to look very close to perceive these oscillations.

The effects last mentioned show that in indirect concussion, at least when produced through the medium of the vertebral column, represented in the experiment by the neck of the retort, the motion is distributed in the brain from within outwards.

Every kind of violence, indeed, communicated through the spinal column, or by the lower jaw, impinging in its ultimate course, on some point of the base of the cranium, naturally diffuses itself from the point of impaction all round within the brain.

It is possible also to conceive a third case, that is, where violence is applied at once, directly and indirectly; and in this instance, which is common, the two species of impulse encounter each other in the interior of the brain, and there produce disorders more considerable than if either sort took place singly, though with a force equivalent to the two united.

Lastly, oblique blows on the retort produced in the threads vibrations relative to their direction, which may be easily understood from what has been said in the case of direct and indirect impulse.

The experiments thus shortly noticed illustrate the mere mechanical effects of violence inflicted in various modes on the cranium. They show that the membranes may be forcibly detached at the point, or opposite to the point of impulse; that the substance of the brain may be lacerated; and that the particles of which the brain is composed undergo vibrations more or less extensive; and that the vibratory motions thus produced may, or may not be accompanied with forcible separation and rupture of vessels, but that they are always followed by so considerable a change in the constitution of the brain, and the motion of the blood within its vessels, as to cause, first, a suspension of the functions of the organ, and then such derangement in circulation as to induce inflammation.

These mechanical effects of violence inflicted on the *cranium* are, therefore, followed more or less speedily by changes in the physiological state of the brain; and as these changes, though dependent on the physiological properties of the organ, necessarily are unhealthy, they are pathological, or, in other words, vital changes in a morbid or unhealthy state. Though it is not known exactly by what mechanism these morbid changes are effected, it is not difficult to understand, that where the constituent particles or matter of any organ receive a violent shock, they cannot remain immediately after in the same condition in which they were before the shock was inflicted. As already suggested, this shock operates in the case of the brain at once on the cerebral substance, and on the vessels distributed through it. The former is shattered as it were. In the latter the mo-

tion of the blood in the vessels is suddenly stopped, and sometimes the vessels are ruptured, and blood escapes into the contiguous parts.

The pathological and symptomatic effects of this sort of injury vary according to the degree of violence and the primary mechanical effects induced; and as these are rarely simple, and often complicated with, or complicate each other, it is often very difficult to distinguish all the pathological effects from each other. The chief subject in the present chapter deserving notice is the circumstance of the occurrence of inflammation; and in this respect four points at least deserve attention.

1. It is only in that order of cases in which either death is not immediately produced by the violence of the shock, or in which the brain or its vessels are not so much lacerated as to cause a great effusion of blood, that inflammation takes place. In general, concussion and the temporary suspension or annihilation of all the cerebral functions attending it, constitute the intermediate stage between the injury and the developement of the inflammatory symptoms. The duration of this stage may vary. In some it comes on rapidly, that is, in the course of three, four, five, or six hours; in others it takes place after twelve or eighteen hours; and in others, in which the shock has been moderate, it does not take place till after three or four days. Lastly, in a certain class of cases the violence is succeeded by a slight but rather constant giddiness, a girding or constrictive sensation often felt in various parts of the head, and feelings of confusion; and at the end of three or more weeks, the symptoms of cerebral or cerebro-meningeal inflammation are slowly and obscurely developed.

2. The effects of external violence are to induce not only cerebral but meningeal inflammation; and, indeed, the latter is perhaps more constantly and uniformly induced than the former; or, at least, it takes place at an earlier period after the infliction of the injury, attains in a shorter time a greater degree of intensity, and more speedily gives rise to those morbid products which disturb, interrupt, or destroy the functions of the organ. Hence in most cases of injuries of the head, terminating with symptoms of fever, frontal or general headach, delirium, stupor, convulsions and coma, fluid is found in the subarachnoid tissue, sero-albuminous fluid in various points of the arachnoid membrane, especially near or diametrically opposite to the point in-

jured, or at the base of the brain, more or less vascular injection of the *pia mater*, fluid effused within the ventricles, and vascular distension of the choroid plexus.

3. Though violence inflicted on the head be thus followed at different intervals, in different circumstances, with symptoms of inflammation of the membranes, yet inflammation of the substance of the brain terminating in sero-purulent infiltration and softening, in bloody, or amaranth, or hortensia coloured softening, or in the formation of abscess of the brain or *cerebellum*, or in greenish coloured softening, may also take place. In the latter case the symptoms of stupor, obtuseness of apprehension and intellect, and sometimes insensibility and unconsciousness with palsy, ensue rapidly, and predominate over, or obscure the symptoms of headach, delirium, and giddiness.

4. Though violence inflicted on the head be thus followed at different intervals, in different circumstances, with symptoms of meningeal and cerebral inflammation, yet it is peculiar to cerebro-meningeal inflammation produced in this manner, that, as it succeeds concussion, its early symptoms, and sometimes the symptoms of the confirmed stage are obscured, and as it were masked by the symptoms of concussion. As M. Gama has well observed, after undergoing a violent shock or concussion, the brain remains in a state of debility and stupor more or less lasting, and during which it is uncertain whether the patient is to recover his health or be attacked with inflammation. The ensuing reaction, or that state of the vascular system of the brain which succeeds the shock, is sudden or slow, always in proportion to the rapid or the gradual disappearance of the symptoms of concussion, and pretty often it in some sense encroaches on the stupor by which these symptoms of concussion are distinguished; and the latter may persist in the brain, notwithstanding the change induced by the presence of inflammatory symptoms. The irritative symptoms are then less intense than they would have been if the textures smitten with inertia had experienced a more lively and complete reaction. Thence also a mixed assemblage of symptoms, or those depending on stupor and irritation united, take place, and render at once the diagnosis of the disorder obscure, and its treatment difficult and uncertain.

It hence results that, in a certain class of cases of this description, the cerebral inflammation has been observed to proceed

to diffuent softening in persons in whom the symptoms of cerebral inflammation (*encephalitis*) had been obscure, and who had therefore appeared to some observers to contain in their brain a peculiar destructive principle. The true explanation of this circumstance, however, is to be found in the fact, that the inflammatory process is prevented from evincing and manifesting its proper external symptoms by the presence of that suspension or obscuration of the functions of the brain which is the immediate result of the concussion.

As the encephalic inflammation is more or less intense, and spreads over the surface of the brain and its membranes, or penetrates into the interior of the organ, the external phenomena are multiplied or confounded, or change their character. M. Gama thinks that, from this succession of effects, it is possible to judge whether a part previously inflamed has been involved in the general mischief; but he justly believes that confusion would result if it were thus attempted to specify each of the portions inflamed, as some practitioners have undertaken to do. The most constant symptoms in the early stage of traumatic *encephalitis* are certainly supra-orbital or frontal headach, and convulsive symptoms indicating cerebral congestion and irritation; and to these are added delirium, sometimes at the same time, sometimes subsequently, with sopor or coma, or at least insensibility to external impressions. It is not in all cases practicable to say whether these symptoms belong solely to the surface of the brain, and therefore to the membranes, or to the substance and deeper parts of the organ without affection of the membranes.

Traumatic inflammation, or that which succeeds external violence, may assume either the acute or the chronic character.

In the acute form, while the patient has as yet recovered imperfectly from the stunning effects of the injury, if he is about to be attacked by *encephalitis*, the head is heavy, the thoughts are confused, a dull deep-seated pain is felt at the wound or site of the blow, and extends to the frontal region, and the patient is inclined to sleep and averse to be disturbed. At the same time the carotid arteries beat a little quickly and forcibly; the face becomes red and hot; and vomiting may ensue.

About from twenty-four to thirty or thirty-six hours after the injury, the pains, becoming more violent and throbbing, occupy a great extent of the head, and are felt with most force at the

frontal region, with more or less giddiness, glaring or injected eyes, incorrectness of judgment, and more or less restlessness as night approaches. The errors in judgment become more constant and violent, and complete delirium, often of a furious and impatient character, is established, with sleeplessness.

Sympathetic irritation of the stomach is indicated by thirst, epigastric tenderness, or pain and vomitings. The pulse, though variable, is generally rapid and tense. In general, the extremities are the seat of a sense of weight and suffering; they are not retained in the same position, but alternately extended and inflected, until towards the close of the disorder they remain in a state of permanent flexion. Spasmodic motions and subsultus ensue in some cases, and may accompany the first symptoms of irritation; in other cases the articulations are stiff and immovable, and instead of convulsive shocks, the muscles are the seat of continual traction.

The alvine and urinary discharges are in general unfrequent, but are performed either involuntarily or without the consciousness of the patient.

In certain forms of inflammation the delirium is more violent. It is often joyous, whimsical, and argumentative, and relates to a small number of serious subjects which have at other seasons occupied the attention.

The forehead and coronal region is generally hot, while the rest of the skin, especially that of the extremities, is cold and dry. The face is reddish, with a dingy tint round the eyes; and in some instances the head and face shew a tendency to moisture, or even profuse perspiration.

As the symptoms continue, the motions of the tongue are embarrassed; the individual speaks thick and inarticulately, or becomes at length unable to speak, and mutters inarticulately, often with marks of anger that he is not comprehended. The senses are obtuse; the need of drink is not felt, though the tongue is encrusted with a dry black fur. Agreeable liquids may still be taken; but thick, bitter, and unpalatable fluids are obstinately refused.

The symptoms now enumerated are followed at variable periods with general languor and feebleness, stupor, or the combination of stupor and delirium, named *typhomania*, increased unconsciousness and insensibility; and the only marks of either are afforded in the patient directing his hands to the head or

wound, tossing the head, inarticulate moanings, and slight or constant convulsive twitches. Irregular shiverings and variable in duration or transitory tremblings ensue; and the whole surface exhales a well-marked mouse-smell odour as in the state of deep stupor.

The symptoms last enumerated, which often denote sero-albuminous or sero-purulent infiltration and softening or actual purulent collection, are succeeded more or less speedily by those indicating the approach of death. The eyes and features are agitated by convulsive motions; the muscles of the trunk and extremities are contracted by shocks; the head is drawn backwards, and remains fixed as in opisthotonic tetanus, while, if palsy has not yet appeared, in general it attacks the muscles of that side of the body opposite to the site of the violence. At the same time, the indications of the perception of pain are no longer observed. The urine and the alvine discharges exhale a putrid odour, and escape involuntarily. The extremities become cold; the features are decomposed; deglutition is impracticable, and fluids regurgitate; the surface is covered with a cold viscid sweat; and while respiration is short, rapid, and laborious, and the contractions of the heart, though strong and jarring, are not transmitted to the arteries with sufficient force to cause the latter to be felt in the extremities, coma gradually or suddenly terminates in death.

Such is the usual course of the acute form of the disorder.

In the chronic form the chief peculiarities are, that a longer interval ensues between the injury or injuries, and the development of febrile and inflammatory symptoms. These symptoms are less violent and less distinctly marked; and the time which they occupy in running their course from their first development to their termination in death, resolution, palsy, or mental derangement, is generally longer.

Traumatic encephalo-meningeal inflammation may terminate, 1. in resolution; 2. in serous, sero-albuminous, that is lympho sero-purulent or purulent secretion, either in the membranes or in the ventricles of the brain; 3. thickening of the membranes, especially of the *dura mater*; 4. serous or sero-purulent infiltration into the substance of the brain, constituting softening, or, within a proper capsule, causing an abscess; 5. induration, either alone or with softening; 6. hemorrhage with softening. Gama mentions such terminations as scirrhus, lardaceous, can-

cerous, encephaloid, fibrous, and polypous degenerations ; but these cannot with propriety or justice be regarded as the results or consequences of inflammation, especially that which ensues on injury. The only kind of transformation of this nature which is truly observed to follow on traumatic inflammation is that of simple induration or hardening of the brain.

The terminations now specified are enumerated in the anatomico-pathological sense, or according to the changes induced in the membranes or in the brain. These are attended with peculiar symptoms, which, either singly or concurrently, are liable to considerable variation. Thus, when either the morbid action does not terminate in that degree of resolution, which is compatible with the performance of the cerebral functions and the continuance of life, or does not extinguish life, it may give rise to, 1. epileptic symptoms ; 2. paralytic symptoms ; 3. epileptic and paralytic symptoms combined ; 4. to impaired memory ; 5. to impaired intellect, to impaired memory and intellect ; 6. to paralytic symptoms, with impaired memory, proceeding often to fatuity ; 7. to more or less general palsy, with mental imbecility.

These different symptoms it is difficult to connect with any uniform sort of lesion. But from the cases which I have seen and described, and those which I find recorded, I think the following general deductions may be established.

1. In cases in which *hemiplegia* of one side succeeds injury or the consequent inflammation, and is attended, as it usually is, with slow or hesitating speech, and some loss of memory, as well as imperfect apprehension, in general softening has taken place on the side injured ; but it has been fully repaired by the gradual and mutual approximation of the surrounding parts of the brain, while the investing membranes adhere with unusual firmness, and sometimes the whole are united in a solid mass.

2. In cases in which epileptic or paralytic symptoms take place after traumatic inflammation or injury, and are attended with slow, hesitating, stammering speech, or in which these are soon followed by loss of memory and slowness of apprehension, there is reason to infer that the membranes of the brain, especially the *dura mater*, have become thickened, and that part of the brain itself has been either indurated, or affected with induration and softening.

3. In cases in which mental imbecility succeeds an injury of

the head, with or without paralytic symptoms, the membranes, especially the *dura mater*, are in general thickened, fluid is infiltrated into the subarachnoid tissue and the spinal *theca*, fluid is accumulated within the ventricles, and the fornix is softened, and the *septum lucidum* is destroyed.

4. In cases in which paralytic symptoms, with or without convulsive symptoms, and with mental imbecility, continue for some time, and are accompanied with quick pulse and other symptoms of febrile disorder, and terminate in apoplectic death, there is reason to suspect the presence of abscess of the brain, either in the ordinary or the encysted form.

TREATMENT.—In all cases in which the symptoms indicate the presence of inflammation of the brain, it is absolutely necessary to employ, with the greatest promptitude and energy, every part of the antiphlogistic regimen. The particular measures by which this is to be carried into effect are, blood-letting, general and local, shaving the head, and the application of cold to the scalp, the administration of cathartics, the exhibition of diuretics, and the employment of revellents or counter-irritants.

Blood-letting from the system is, in the majority, I am disposed to say, in all cases the most urgent and indispensable remedy, and if used promptly will seldom fail to prove efficacious. To insure this result, however, it should be employed at the first indication of the symptoms, for instance, headach, giddiness, or any affection of the sight or hearing, at the first appearance of sickness or vomiting, at the very first appearance of insensibility, unconsciousness, or loss of motion. The principal reason of the inefficiency of blood-letting consists, on the one hand, in the disease being mistaken at the first onset either for syncope, or common headach, or sick-headach, or in no attempt being made to arrest its progress, or abate its violence, until paralytic symptoms have taken place, or in considering the paralytic symptoms as purely nervous. All of these errors are equally pernicious. Whenever headach has continued for several days, and is followed with a fit, in which the patient falls down with partial or temporary loss of consciousness, the practitioner will act wisely to examine the case carefully, and if there be sickness or vomiting, with quick pulse, or even a heavy labouring pulse, to detract blood from the arm to the extent of eighteen, twenty, or twenty-five ounces at first, and then to be guided by the effects and the state of the symptoms.

When a paralytic attack has actually taken place, this indicates not that the disease is beginning, but that the morbid process in the brain had already caused considerable destruction, by destroying the connection or link between the sensorial part of the brain, or that which is the seat of the will, and the nervous chords distributed to the muscles. The whole of these chords remain entire and uninjured; and the lesion which is the cause of the paralytic symptoms is seated in the brain, and often in the central part of its hemispheres. No agent, therefore, which does not act on the process going on in these parts, will be remedial; and no agent, which is not put in operation before much mischief is accomplished, will arrest the progress of the disorder. A certain quantity of blood and lymph is effused, or lymph or sero-albuminous fluid is deposited; and no agent which does not prevent these from destroying the texture of the cerebral hemispheres can be expected to be sanative. Hence it results, that, when a paralytic attack has actually taken place, blood must be drawn, in order to prevent further effusion, to keep the inflammatory process within proper limits, both as to extent and degree, and to prevent the part of the brain already affected from being, if possible, wholly destroyed.

The hypothesis of ascribing the paralytic symptoms to mere gastric disorder, independent of lesion of the brain, or looking on them as nervous only, without disorder in the cerebral vessels, is not less erroneous and detrimental. Perhaps no case of softening of the brain, either hemorrhagic or inflammatory, takes place without symptoms more or less evident of gastric and gastro-hepatic disorder; and too often these have been proceeding for a considerable time, so that one of the therapeutic indications is to rectify the symptoms of gastric and gastro-hepatic disorder in every case of cerebral inflammation or hemorrhage. But if the practitioner trusts to this alone, he will make no sanative impression on the cerebral disorder; and the paralytic symptoms, with those of intellectual disorder, will remain stationary or deteriorate.

In one sense every paralytic disorder is nervous, in so far as its pathological cause is seated in the nervous system. But this is not what the advocates for the existence of Nervous Palsy, properly so called, understand. They imagine a mere loss of command over the voluntary muscles, unconnected with any unhealthy state of the brain or nerves, or their blood-vessels.

Without pretending to say that such loss of command over the voluntary muscles may not occasionally take place, I maintain, that it is an occurrence of exceeding rarity; that all instances of spastic rigidity, paralytic contraction, or complete paralysis, coming on suddenly after symptoms of uneasiness in the head, and all instances of *hemiplegia*, are connected with, and proceed from, more or less inflammatory or hemorrhagic softening of some part of the brain or its vessels; and that every attempt to treat such paralytic seizure as a mere nervous affection argues ignorance of the nature of the disorder, and will be abortive.

In every instance, therefore, in which, after or with symptoms of pain in the head, quick pulse, coldness of the extremities, or excessive sensations of cold in one extremity, *vertigo*, or a fall taking place without adequate cause, loss of memory, one arm or one or both legs are affected either with paralytic contraction or palsy, or complete *hemiplegia* takes place, the proper course is to detract from eighteen to twenty-five ounces of blood from the arm, and in the course of six, eight, or ten hours, to detract as much more, if the patient's strength will bear it. It is sometimes even requisite to take blood to this amount repeatedly before spastic rigidity subsides, the control over the voluntary muscles is recovered, or the paralytic contraction is relaxed. The wise course is to draw blood until the symptoms of paralysis are manifestly diminished, and if a sufficient quantity cannot be drawn at one or two or even three blood-lettings to accomplish this object, the evacuation may be repeated a fourth, fifth, or even a sixth time. I have found it requisite in persons young or middle-aged, and otherwise with unimpaired constitutions, to perform blood-letting as often as eight or ten times, and each time to the extent of from twenty to twenty-five or thirty ounces.

Where it is believed that, from the age of the patient, or the impaired and enfeebled state of the general powers, or from the presence, as is often the case, of disease of the heart, it is not safe or practicable to draw blood from the system on this extensive scale, it is expedient, after the first or second blood-letting, to have recourse to local bleeding by means of cupping, or the application of leeches to the head. Cupping has the advantage over the use of leeches in this respect, that it enables the practitioner to take from the vessels of the head, in a short time, a precise and definite quantity of blood, and, consequently, to know

more positively, than by any other means, the effect of a certain amount of blood discharged upon the cerebral disorder and its symptoms. But the bleeding from the bites of leeches, it is argued, being chiefly from the capillary vessels, is conceived to be better suited for abating the vascular congestion of a cerebral inflammation, and counteracting the formation of morbid products. Both modes of evacuation I believe to operate chiefly on the capillary vessels; but while the evacuation by cupping is more prompt, and may in this respect, and in the amount suddenly detracted, exert effects similar to those of a general blood-letting as well as local, that by leeches is believed to be, though longer in operating, and not very certain in its amount, not less efficient as a local evacuation. Gama has urged against cupping and scarifying, the objection, that it can only be practised at the cervical region, and that, if done on the head, it is liable to be injurious, by piercing and detaching the pericranium, and by the violence of its traction on the cranial coverings. It could certainly not be desirable to injure the pericranium either in ordinary inflammation of the brain or that which ensues on injury. But cupping presents so efficient and speedy a mode of local depletion, that in those cases in which the symptoms indicate depletion, while general blood-letting may be contraindicated, it would be wrong to neglect its employment.

In all cases in which local blood-letting is thought requisite, it should be drawn from the side of the head on which the symptoms show that the brain is affected. Thus, when the right side is hemiplegic, or the right arm or right leg is in a state of paralytic rigidity or permanent contraction, as there is every reason to believe that the left hemisphere is the seat of the inflammatory or hemorrhagic congestion, blood should be drawn from the left side of the head or the left side of the cervical region; and when the paralytic symptoms affect the left side of the body, blood should be drawn from the right side of the head or cervical region. When there is no paralytic symptom to guide the practitioner, it is proper to apply leeches to the temples, to the frontal region, or over the mastoid processes.

Where it is impossible to obtain leeches, and not very practicable to cup, incisions may be made through the skin of the scalp, and the blood allowed to flow till a sufficient quantity has been drawn. And in injuries of the head with wounds, the bleeding from the latter is often beneficial. The safest plan,

however, is for the practitioner to keep this in his own hand by blood-letting from the arm, or local depletion by means of leeches. The latter are more applicable than cupping in all cases of inflammation consequent upon injury, or when the shock from the scarificator is sometimes liable to be hurtful.

Next to general depletion, and often of great efficacy, is the removal of the hair, and the application either of cold water or ice to the shaven scalp. The effects of both should, however, be carefully watched; and it is more prudent to apply cold water or ice for about ten minutes or a quarter of an hour at a time, than to keep it constantly applied. The restrictions above-mentioned, (p. 38), should be observed. The scalp should not be chilled.

Not less important is the employment of cathartic medicines, not only as a means of removing foul secretions, and diminishing general plethora, but as a means of producing powerful revulsion from the brain and its membranes. If sensibility and consciousness with the faculty of swallowing be not lost, the best plan is to give six or eight grains of calomel, with two or three drops of croton oil, or six or eight grains of calomel with an equal quantity of extract of colocynth and aloes; and, unless by this, not only the feculent contents of the bowels are expelled, but several liquid motions are produced, it will be requisite to give four or five ounces of the saline infusion of senna, or a sufficient quantity of a solution of any of the neutral salts.

After the bowels have been thoroughly evacuated, it is often advantageous to employ nauseating remedies, especially tartrate of antimony, in minute doses, that is about one-quarter or one-sixth of a grain every second hour. Care must be taken, however, not to allow it to induce vomiting, otherwise there is hazard thereby of aggravating the disorder. This remedy is always most beneficial when it induces either slight general diaphoresis or several liquid motions without tormina, or slimy or bloody stools.

As the urine is scanty, turbid, and hypostatic, it is generally requisite to attempt to increase its quantity, and to improve its qualities; and, though both of these objects are chiefly accomplished by the same means by which the violence of the inflammatory action is abated, yet it is advantageous to employ diluents, and administer those diuretic medicines which have a tendency gently to stimulate the action of the kidneys. Of these

the most suitable are, bitartrate of potass, acetate of potass, and nitrate of potass. The first may be used as a common drink ; the second may be in its ordinary diuretic doses ; and the third is advantageously used as a refrigerant diuretic in doses of five grains three or four times daily.

The revellent agents may be employed, either applied to the head, or to parts of the body remote from the seat of disorder.

The hypothesis according to which the use of these remedies was recommended was, indeed, erroneous and unfounded, in so far as it proposed, by their employment, to stimulate torpid or inert parts, and deobstruate or re-open tubes which were believed to be obstructed. It is known that they have no powers of the kind, and that, although they possessed such qualities, the state of the nerves in this disease is not such as could be benefited by remedies with such properties. It is known that their principal use is, by exciting more or less superficial irritation and inflammation, to diminish and remove that which is going on in the deep-seated textures. It is chiefly in this mode that rubefacients, epispastics, and other revellent or derivative remedies, prove therapeutic in cases of cerebral inflammation.

It is a practice not uncommon to apply the common blistering plaster to the nape of the neck, or that side of the head opposite to the paralytic side of the body, and it often appears to be productive of beneficial effects. It seldom happens, however, that one blister is of much benefit, and several in succession are often applied before decided beneficial effects are observed to ensue. Blisters, it must be also remarked, are not suited to the early and intense stage of the disorder ; and while blood-letting, general or local, is in this stage the most urgent remedy, it is only after these have been carried to a sufficient extent, both in amount and by repetition, that blistering the surface of the scalp or nape of the neck shows beneficial effects. They are most suited, in short, to the declining stage and the chronic form of the disorder.

To the application to the scalp of the various irritating liniments and ointments, as croton oil liniment, turpentine liniment, antimonial ointment, the same conditions and the same restrictions are applicable.

Rubefacient applications, as sinapisms, are most usually applied on parts remote from the head, for instance, upon the thighs, the calves of the legs, or the feet, or sometimes upon

the arms. They cannot be regarded as powerful agents; but they are often used with the hope of exciting sensation in paralytic limbs.

In conducting the treatment of the chronic form of the disorder, it is requisite to employ general blood-letting more cautiously and sparingly, to limit evacuations from the vascular system to local bleeding, especially by means of leeches, to trust chiefly to the employment of cathartics for regulating the actions of the alimentary canal, and to obviate plethora, and prevent gastric disorder, by due attention to diet. It is also advantageous to keep the scalp shaven, and wash it daily with cold water.

Revellent remedies of various kinds have been also suggested as most suited to the chronic form of the disorder; and either blisters should be applied repeatedly, or the tartar-emetic ointment should be rubbed on the scalp and nape of the neck, until pustular inflammation is rendered more or less general, or a seton may be introduced through the skin of the nape of the neck, and allowed to remain for some weeks.

It is, however, an inconvenience not inconsiderable, that the cutaneous irritation and inflammation induced by these agents is, in certain circumstances, and at particular seasons, followed by severe attacks of rose of the head and face,—a circumstance which, from the great febrile disorder induced, is always hazardous to patients labouring under any affection of the brain.

In consequence of observing the property which the *St Ignatius bean*, and all substances containing strychnia, possess of exciting spasmodic motions in the voluntary muscles, the employment of this substance has been proposed by Fouquier and some others as a remedy, not only for paralytic affections in general, but for that species of palsy which results from cerebral hemorrhage and inflammation; and it has been used with this indication, not only internally but endermically, that is sprinkled over the denuded corion, so as to be absorbed. In the latter method, which has been most frequently practised of late years, one-fourth, or one-sixth, or one-eighth of a grain of strychnia is sprinkled on any part of the skin, previously deprived by blistering of its cuticle. In this mode the first effects are slight smarting, and after the lapse of two or three hours, involuntary spasmodic twitches in the muscles of the extremities. If these be not induced, another one-fourth or one-sixth of a grain may be sprinkled

on the exposed corion, and even a third, until spasmodic twitches take place. If they do not then ensue, it is imprudent to urge the remedy much further. After the physiological effects now mentioned have taken place, it sometimes happens that a little more command over the muscles is observed, or, at least, that some degree of power is recovered; and hence it is inferred that strychnia exerts therapeutic effects on palsy and other symptoms depending on softening of the brain. I have both used strychnia in the endermic method, and have exhibited the extract of *nux vomica* internally in the treatment of this species of palsy; but I cannot say, that I have observed its employment to be followed by those beneficial effects, which have been ascribed to its use in the practice of other physicians. I admit that the physiological effects have followed, and in some instances a slight degree of power has appeared to be recovered; but I must add, that other remedies, as local depletion, blisters, and cathartics or antimonial medicines, were at the same time employed; and I must further add, that, in cases in which no strychnia has been administered, the same degree of recovery had taken place.

It is also necessary to mention, that the use of strychnia is by no means void of danger. M. Lallemand mentions that he saw, (*Lettre 2d*, p. 267, § xx.) cases in which its administration to a considerable amount, appeared to be followed by a great increase in the rigidity of the limbs, spasmodic contraction, and violent shocks, terminating fatally. In the two cases mentioned by Lallemand, a considerable quantity of blood was found effused within the hemisphere, with diffuent softening around; and the author is disposed to ascribe this change to the action of the strychnia. M. Bouillaud also records two cases, (xii. and xiii.) in the first of which its use to a considerable amount, half a grain, and one grain, was followed by no motion in the paralytic limbs, and in the second, after two grains were taken, the face became much flushed, and consciousness and speech were lost, and next day convulsions in the paralytic limb, and stertorous breathing were followed by death.

It appears to me, in short, that the use of strychnia in *Encephalitis* has been adopted on a false and erroneous physiological analogy. It is, doubtless, a physiological fact, that this alkaloid possesses the faculty of exciting involuntary spasmodic motions in the muscles. I am not aware, however, that it has been shown

to possess any power of exciting voluntary motions in the muscles; and, indeed, no agent can do that which does not possess the power of restoring the link of communication between the brain and the nerves, which has been forcibly destroyed by the disease in the former. In the property which strychnia indeed possesses of exciting involuntary spasmodic motions in the voluntary muscles, it bears a close resemblance to the inflammatory process in its early stage, the destructive effects of the middle and latter of which it is thus expected to remove. It may well be asked, whether it is consistent with physiological or pathological principles, to expect that an agent, the physiological effects of which closely resemble the effects of a morbid process, should be capable of opposing, obviating, or removing the symptomatic effects of that process; or whether it is reasonable to expect that a substance which excites only the involuntary and abnormal motions of the voluntary muscles, should be capable of restoring the power of voluntary motion when lost?

If, however, notwithstanding these views, any one wishes to employ this remedy in the removal of paralytic symptoms, I may refer him to the interesting reports of Dr Bardsley, and the work of the late Mr Mart.

With similar intentions leopard's-bane (*Arnica montana*,) and the poison oak (*Rhus toxicodendron*,) and some of the other acrid narcotics, have been recommended and employed by various practitioners. The leopard's-bane is still much used in Germany and France; but the effects ensuing on its employment seem to be neither certain, uniform, nor beneficial. The leaves of the poison oak were strongly recommended by Dr Alderson of Hull. In physiological effects, it appears to correspond closely with *nux vomica* and *strychnia*; and I believe that the remarks already made on the latter substance are applicable to the former.

After what has been above stated on the nature and tendencies of this disorder, it must be superfluous to say, that the diet ought to be spare in quantity and unstimulating in quality, and that, both in the acute and chronic forms of the disorder, every article likely to excite the action of the heart, to induce venous plethora, or to cause or increase congestion in the brain or its membranes, or even to irritate or excite the stomach, or disorder the alimentary functions, should be most religiously avoided. It is remarkable, nevertheless, that many persons, deceived by the external but insidious appearances of feebleness and imperfect circulation, think that it is necessary to allow nutritious food

and stimulating liquors, and administer tonic medicines in the treatment of this disease. It is not wonderful that loud complaints are daily made of the inefficiency of medicine, and that it is really inefficient. But it would be wise to consider, how much of this inefficiency is to be ascribed to the ignorance of practitioners, and the pernicious effects of improper diet. Medical treatment cannot be beneficial unless its effect is to control the morbid action, to prevent it from increasing or spreading, and to enable the overloaded vascular system of the brain to recover its usual condition. This can only be accomplished by diminishing the fulness of the vascular system; and though this is directly and temporarily accomplished by depletion, cathartics, and other evacuants, it is more effectually and permanently effected by dietetic measures.

During the acute stage of the disorder, the diet should be altogether low,—scanty in amount, and unstimulating in quality. Gruel, tea, coffee, and similar diluents alone are admissible. All animal matters, even in the fluid shape, ought to be withheld; and wine and malt liquors ought on no account to be permitted. When the disease is on the decline, and when it assumes the chronic form, the diet may be less sparing, but it should be equally unstimulating. Solid animal food is unsafe, and even liquid animal food may be rather exciting to the stomach and vascular system. The diet should be restrained as much as possible, at least for a considerable time, to milk and the farinaceous grains.

All vinous liquors, malt liquors, and spirituous stimulants ought to be strictly and absolutely prohibited. Some persons imagine that diluted spirits are safer than wine, and because persons accustomed to the latter ought, they argue, not to abandon all stimulants altogether, they may, therefore, take a little spirits much diluted with water. This is a most pernicious error. Not only are the spirituous stimulants unnecessary, but they are positively injurious, and never fail to aggravate all the symptoms and accelerate the approach of the fatal termination.

It is, on the other hand, certain that recoveries are effected under the observance of an opposite system of diet. I have seen several instances in which, if the disease was taken early, and treated with promptitude and judgment, its progress was retarded and ultimately arrested; and of these, if my limits allowed, I could mention several. I prefer, however, referring to the interesting and pointed illustration of the efficacy of proper die-

tetic treatment, and especially a dietetic course, excluding solid animal food and all stimulating liquors, afforded by the history of the case of Adam Fergusson, Professor of Moral Philosophy in the University of Edinburgh, as described by Dr Black in the seventh volume of the Medico-Chirurgical Transactions. This gentleman was attacked, when about 50 years of age, with symptoms of incipient cerebral inflammation and *hemiplegia*, for which blood-letting, evacnants, and low diet were, in the first instance, ordered. Under the use of the restrained diet and laxatives, the paralytic symptoms entirely disappeared. For a space of thirty-nine years after his paralytic seizure, he refrained altogether from the use of solid animal food, excepting occasionally white fish,—living on soup, with barley or vegetables and bread, and drinking only pure water. In this manner he lived till his 89th year, without any return of his symptoms; he then occasionally took a little solid animal food, but died in his 93d year, with symptoms indicating affection of the brain. (Medico-Chirurgical Transactions, Vol. vii. p. 228.)

Upon another piece of practice occasionally resorted to in certain forms and stages of this disorder, I feel it requisite to animadvert. Where the paralytic symptoms are not well-marked, and delirium is violent with restlessness, means of restraint have been occasionally proposed and adopted. The practice is at once irrational and injurious, and should never be employed on any account. As the only mode of restraining the delirium is found in what removes its pathological cause; twenty or twenty five leeches applied to the head, and thorough evacuation of the bowels by purgative *enemata*, followed by the use of ice to the scalp, will furnish a much more efficient method of allaying the irritation of the brain and inducing quietude, than any means of coercion or restraint, however powerful.

The antimonial injection recommended by Desault is in this state of symptoms a useful remedy. From five to ten grains dissolved in ten ounces of water may be injected into the rectum.

§. II. Pulpy Destruction of the Spinal Chord. *Myelitis*, Harles and Klohss. *Notaeomyelitis*, Hildenbrandt. *Racheomyelitis*, Wenzel. *Rachialgitis*, Jos. Frank.

Hæffner, Diss. de Medullae Spinalis Inflammatione. Marburgi, 1799.—J. P. Frank De Vertebralis Columnae in morbis dignitate, Opusc. Med. Tome ii. —L. Brera Cenni Pathologici della Rachialgite. Livorno, 1810.—Berga-

maschi Obs. Sulla Infiammazione della spinale midolla e delle sue Membrane. Pavia, 1810.—Heer de Inflammatione Medullae Spinalis. Erlangae, 1813.—Chr. Fr. Harles, Practische Bemerkungen über die Myelitis. Nurnberg, 1814. Observations on the Symptoms and Treatment of Diseases of the Spine. By Thomas Copeland. London, 1815.—V. Racchetti della Struttura, delle Funzioni, e malattie della Midolla Spinale. Milano, 1816, p. 348.—Barbaroux, Diss. de Medulla Spinalis Inflammatione. Taurini, 1818.—Funk Die Rücken marksentzündung. Bamberg, 1819.—Klohss, Dissertatio de Myelitide. Halae Saxonum, 1820.—Bergamaschi Sulla Mielitide stenica et sul Tetano. Pavia, 1820.—Notice sur l'Inflammation aigue de la substance medullaire du rachis. Par Scipion Pinel. Paris, 1821, 8vo.—Sonnenkalb Eine eigene und ganz besondere Krankheit des Rückenmarks nebst einigen Bemerkungen über die Entzündung desselben. In Der Zeitschrift für Natur und Heilkunde dritten Bandes erstes Heft Seite 65. Dresden, 1823.—De la Moelle Epiniere et de ses Maladies. Par C. P. Ollivier d'Angers. A Paris, 1824. 8vo. pp. 401.—Carl Wenzel der Heilkunde Doctor Geheimerrath u. s. w. Über die Krankheiten am Rückenrath. Mit Acht Kupfertafeln. Bamberg, 1824. Folio, pp. 400, xcviii. p. 396.—Report on the Cases treated during the Course of Clinical Lectures delivered at the Royal Infirmary in the session 1832–33. By David Craigie, M. D., &c. Edinburgh Medical and Surgical Journal, Vol. xli. p. 76–79. 1834.—Traité des Maladies de la Moelle Epiniere contenant l'histoire anatomique, physiologique et pathologique de ce centre nerveux chez l'homme. Par C. P. Ollivier d'Angers. Troisième édition. Paris, 1837, 2 tomes, 8vo.

THE inflammatory process produces in the spinal chord very similar changes to those which are observed to follow its presence in the brain. These changes are of two kinds at least, disorganization with softening,—and induration or hardness of the chord. Thus, it may be reddened and softened; it may be infiltrated with serum, and softened; it may be infiltrated with sero-sanguine, sero-purulent, or purulent matter, and softened; or it may be converted into a soft homogeneous semi-fluid mass like cream; or it may be liquefied into a diffuent substance like soft cream. In other instances, the chord is found to undergo a preternatural increase in firmness, and to become unusually solid and hard; and, however different be the effects, there is no doubt that the same process, though in a different form, is the cause.

One of the most satisfactory modes of showing that the softening is the effect of the inflammatory process on the spinal chord is by observing the effects ensuing on external injury. When a person falls so as to receive a severe injury on any part of the spine, the neck, back, or loins, and especially if that injury be accompanied with fracture of two or more of the vertebræ, in general transverse palsy (*paraplegia*) ensues either immediately or soon after. If this symptom come on immediate-

ly, it may be the result either of the concussion or the effusion of blood consequent on the injury. When it comes on more slowly it is the effect of the inflammatory congestion succeeding either on the concussion or on the effusion, or on both conjointly. In the latter case, though the subsequent symptoms are modified according to the part of the chord affected, the same process of softening and separation of the parts takes place. In cases of this kind terminating fatally, the parts of the chord injured, are reddened, sometimes with effusion of blood, always with serum; they are softened, and instead of the smooth clear section which is usually observed, the cut surface is irregular, soft, dull, or void of lustre, of a dead-white or gray or cream-white colour, and falls down very speedily into a soft diffiuent homogeneous semifluid mass, without any traces of the characteristic texture of the chord.

According to the region of the chord affected, the colour and even the softness of the part, and the degree of the softening vary. Thus, in the cervical part of the chord, in which injury and the consequent inflammation are more speedily followed by the fatal event than in the dorsal and lumbar regions, the softened portions generally present more or less of the reddish or blood-coloured softening, sometimes with admixture of blood or sero-sanguine fluid. In the dorsal or lumbar regions, on the other hand, in which weeks may elapse before the disorder impairs or suspends the vital functions, the reddish tinge has either given place to a brownish colour, or the parts are of cream-white, with a few streaks of blood, while more general and complete softening has taken place.

These may be regarded as the acute or subacute forms of the disorder taking place in consequence of external injury; and here we have positive proof that these changes are the result of inflammation, because we know that one of the most sure and constant effects of mechanical injury is inflammation.

The same changes, however, may take place independent of external injury, or at least evident and perceived external injury. *First*, the spinal chord may become softened in consequence of disease taking place in the vertebræ, especially their bodies, or in the intervertebral cartilages. In this case the progress of the disease is slow, and it presents many oscillations. *Secondly*, the spinal chord may become softened either in portions or over a large space, in consequence of the membranous coverings be-

ing inflamed or congested; and the membranes are then red and thickened, their vessels are injected and gorged with blood, and those passing into the chord are both more numerous and larger than natural, and impart to the affected part of the chord a red colour more or less deep. *Thirdly*, the spinal chord may be softened either in portions or over a large space, in consequence of steatomatous transformation and ossification of the rachidial arteries. In this case the parts softened may be reddish or of a red-brown tint, but more frequently they are of a cream-white or yellow colour, and with little concomitant vascularity.

Though M. Recamier and some other physicians consider these softenings of the spinal chord, as well as those of the brain, as a change peculiar to the nervous system, quite independent of inflammation, yet the facts now specified show that this opinion is erroneous. It is true that, in certain cases, patches of softening are observed in the spinal chord without any apparent trace of local congestion; but this merely shows that the change has occupied a longer period in being accomplished, and that, during the latter stage of the inflammatory process, the vascularity had disappeared.

Softening occurs in certain parts of the chord more readily than in others. The lumbar region of the chord is observed to be most frequently the seat of the change, and next to this it is said the cervical portion of the chord. As in these two parts there is more gray matter than in other regions, and as the gray matter is naturally more vascular than the white, this has been supposed to furnish another argument in favour of the inflammatory nature of the lesion.

It must not be imagined, however, that other parts are exempt. I have met with three cases of softening of the spinal chord, two already published, all depending on different causes, and in two of these the myelitic softening occupied the dorsal region, and in one in which the disease was connected with disease of the vertebræ, it also occupied the lower dorsal region of the chord, and extended in a less intense form to the cervical region. (Report in the Edin. Med. and Surg. Journal, Vol. xli.)*

A natural question is to ascertain whether there are means

* It is necessary to mention, that the third case in which the disease was unconnected with disease of the bones is not yet published.

by which this softening, as an anatomico-pathological change, can be distinguished from softening which is not morbid, and must be regarded as cadaveric. The principal means of distinction are found in the fact, that in the pathological softening the change in consistence is not universal, but confined to one portion of the chord, and is generally more complete at one point than at another, gradually diminishing from the most softened portion to those parts the consistence of which is natural, and that it is generally accompanied with redness or vascularity, with redness of the membranes, and varies in colour, being reddish, yellow, or white, or sometimes uniting all these shades in one softened mass. In cadaveric softening, on the other hand, the diminution in consistence is uniform, and extends over the whole chord, is not greater at one part than at any other, and, if attended with redness or congestion either of the rachidial vessels or the membranes, these are most remarkable at the most dependent parts of the chord. The posterior surface is in general more vascular than the anterior in such cases.

Besides softening, inflammation in the spinal chord may be attended with, or terminate in, unusual hardness of the chord. This change in consistence may vary from simple firmness resisting the knife, to the consistence of hard boiled egg, cheese, or even cartilage. (Portal.) Induration is often attended with enlargement in size, and sometimes it is associated with thickening and reddening of the membranous coverings and much congestion in the arteries. (Bergamaschi.) In other cases, according to Ollivier, it is found without redness of the membranes or vascular congestion. These changes in the consistence of the spinal chord are most frequent in the case of epileptic patients, and are sometimes connected with similar induration in the brain.

Lastly, It may be here mentioned, that more or less serous fluid is generally at the same time found within the theca; and this must have been derived from the membranes, especially the *pia mater* of the chord.

SEMIOGRAPHY.—The symptomatic effects of inflammation of the spinal chord, whether it give rise to softening or to induration, are very similar. But they differ in their mode of approach and in their degree, both according to the part affected, and also according to the rapidity with which the disease proceeds.

In the form of the disease which may be regarded as most simple, when it comes on slowly in the lumbar region, the patient generally loses the natural sensibility of the lower extremities, which he feels cold, stiff, and something heavy, and not very readily moved. Sometimes the sense of cold is so constant and urgent, that he imagines the boot or shoe leaks and admits water. The feet and legs are the seat of formication, pricking pains, and sometimes slight twitches or spasms. At length it is observed that the patient is unable to extend or keep his limbs extended, or to perform easily any motion requiring extension. The foot is inclined to be placed on the ankle, the leg on the knee, and the thigh on the pelvis. When the patient walks, he drags his legs with a peculiar stiff awkward motion, not having over them the complete command which he was wont to possess. At length the rigidity increases so much that the patient is unable to extend his limbs, or perform any motion, or assume any attitude requiring extension; he is unable to stand; and if he attempts it, totters and falls; in short, he loses entirely the command over the lower extremities, which are then said to be affected by *paraplegia* or transverse palsy. The rectum and bladder are at the same time more or less paralytic, the latter being overdistended and becoming incontinent.

When the inflammatory softening takes place higher up, for instance in the dorsal, upper dorsal, or cervical region, paralytic symptoms affect the lower extremities much in the same manner, but to these are added various symptoms in the muscles of the trunk and in the organs of the chest and abdomen.

When the dorsal portion is affected, the muscles and surface of the lower part of the chest, and the whole of the abdomen, are more or less the seat of anomalous and morbid sensations and actions. The muscles of the back, loins, and belly, are affected with painful twitchings and spasms, while the surface of the skin is impaired in sensibility. The bowels are very slow and torpid, not easily moved by medicine; and the belly is distended, sometimes with tympanitic sound, in other instances with dulness on percussion. The respiration is short, hurried, irregular, and laborious, chiefly diaphragmatic, but occasionally with ineffectual labour of the abdominal muscles. As the disease advances, that is, as the substance of the chord becomes more completely and extensively dissolved, other symptoms indicating the subverted and annihilated influence of the nerves

ensue. The heart is affected with palpitation, and its beats are irregular and variable in strength. Hiccup also ensues, and becomes very urgent. Vomiting takes place, sometimes diarrhœa, with the intestinal contents voided unconsciously, and often with acute pains in the bowels; and in general, as these symptoms become violent, death ensues.

When the upper dorsal portion of the chord is inflamed, the painful spasmodic motions are felt rather higher up in the chest, while the abdominal muscles and lower extremities are either paralytic or affected with spastic rigidity. The motions of respiration are more completely deranged, being at first laborious and panting, afterwards feeble, languid, and unfrequent.

When the cervical portion is the seat of inflammation, there is often well marked rigidity in the muscles of the neck, and also in those of the thoracic extremities, which are in some cases agitated with convulsive motions, and in other instances are paralysed. The respiration is entirely diaphragmatic throughout the whole course of the disease. At first it is laborious, that is, the individual finds he cannot inspire with the usual facility and effect; then it becomes short and frequent, and is performed anxiously and with pain; and at length it is feeble and languid, and generally slow.

When the disease affects the upper cervical region of the chord and its bulb or the portion next the annular protuberance, the senses are usually disordered, and delirium more or less violent takes place, with locked jaw, (*trismus*,) grinding of the teeth, dry red tongue and difficult deglutition, incapacity to articulate, the motions of respiration limited and tumultuous, vomitings, palsy of the whole body, and sudden death with symptoms of asphyxia.

From the account now given, it appears that the symptoms of *myelitis* are chiefly those changes in the sensibility and mobility of the textures to which the nerves are distributed, more especially the perversion or derangement of the muscular motion, or its total abolition.

Pain along the course of the chord, or referred to various parts of it, is said also to take place; and it is said by some authorities that pain, very acute and deep seated, with a sense of burning heat along the spine, is the most constant symptom. According to Klohss, the pain is aggravated by lying on the back, especially when the patient reclines on a soft yielding plane as a feather-bed, and not on a mattress. It is never ag-

gravated by pressure, because pressure cannot be immediately applied to the inflamed texture.

Pain referred to the site or the course of the spinal chord is not, however, a uniform symptom. M. Pinel Junior, who reports two cases of the disease in the dorsal portion, makes no mention of pain in the back. In the cases seen by myself, though pains were much complained of in the muscles of the trunk, belly, intestines, bladder, and lower extremities, yet none was referred to the spine; and in one case in which the greater part of the chord was softened and liquefied up to the spinal bulb, pain was either not felt, or it was so inconsiderable as to escape the notice of the patient altogether. It is certain that *paraplegia* may proceed to a great extent without the presence of any pain.

Pain, on the other hand, appears to be almost an invariable symptom when the *vertebræ* are inflamed and become carious, (*spondylitis*), or when, either with or without this inflammation, the intervertebral cartilages and synovial membranes are affected with chronic inflammation. If pain, in these circumstances, be felt, it is aggravated by pressure over the spinous processes, and by all attempts to move or rotate the spine or trunk.

When pain is either not at all felt, or is felt very obscurely, and yet the presence of *paraplegia* leads to the suspicion of the existence of more or less vertebro-medullary or meningeal inflammation, a method employed by Mr Copeland, and repeated by Joseph Frank, has been supposed to furnish more accurate information. This consists in the application of a sponge, previously immersed in hot water, successively over various parts of the spinal column. At all points at which the *vertebræ* are not affected, the patient feels only the impression of the hot water imbibed by the sponge; but when the latter is placed opposite a diseased vertebra, or at the level of an inflamed portion of spinal-marrow, he immediately feels a sensation of burning heat. This method I have tried, but find it more applicable to the recognition of the presence of inflamed *vertebræ*, (*spondylitis*), with disease of the periosteum and ligaments, than to simple inflammation of the spinal-marrow (*myelitis*.) It is also no ordinary objection to its application that it causes much suffering in mere spinal irritation, (*rachialgia*,) (*neuralgia spinalis*;) and, on the other hand, causes little or no uneasiness in some cases, in which the existence of paraplegia and febrile symptoms show the presence of inflammatory softening of the spinal chord.

M. Ollivier has solicited attention for another diagnostic method, viz. slight pressure over the spinous processes, by the uneasiness caused by which, he says it is possible to determine even the extent of the myelitic softening. This method I have, however, also tried several times, and found that, though it answers well in cases in which the inflammation of the chord is associated with, or dependent on, disease of the vertebræ, it is of no avail in that obscure class of cases in which principally a certain diagnostic method is wanted, viz. inflammatory softening unconnected with disease of the bones.

Nor is it possible to attach more importance to pain referred to the spine, aggravated by the erect position, and relieved by the horizontal or recumbent; for the same variations in consequence of position are observed to take place in cases in which the bones alone are affected, or in which they are affected primarily, and then communicate their morbid action to the membranes and the contained marrow.

On the other general symptoms of this disorder the opinions of observers are not very well settled. According to Joseph Frank, unless when the disease is induced by external violence, or assumes a latent character and chronic course, its presence is evinced by febrile symptoms so much the more intense, the younger and the more sensitive the patient may be. These symptoms also he represents to approach in general with shivering, followed by a sense of great heat, referred chiefly to the spine, with remissions in the morning. The pulse also he and Hildenbrand describe as frequent, contracted, and hard, but variable; while anxiety, attended with jactitation of the extremities, is urgent. In giving this delineation, however, both authors have confounded inflammation of the spinal membranes with that of the chord itself; and, of course, whenever the former disorder is present, however induced, or is associated with the latter, shivering, followed by heat and small, rapid, hard but variable pulse, are evident symptoms.

It is different, however, in the ordinary class of cases of spinal softening, in which the membranes are not affected. The disorder then makes its appearance in a more insidious and gradual manner. There may be no distinct fit of shivering, but merely wandering sensations of cold confined chiefly to the lower extremities and pelvis, and sometimes affecting the back. It is observed, however, that the skin is dry, cold, and does not

perspire even in bed, or if it do, it is moistened with a cold clammy partial vapour. Most usually, in the early stage of the disease, it is cold and dry, or if it feel hot, the patient complains that it is cold. The pulse is not always at first frequent and hard; but it is generally oppressed and variable. After some time, when it may be supposed the disease has either affected a greater extent of the spinal chord, or is spreading to the membranes, or is affecting and irritating the roots of the splanchnic nerves, the pulse becomes rapid, varying from 96 to 116 or 124, and is still smaller, and sometimes hard; and at periods still more advanced, it is constantly rapid and small, while the skin is dry, or alternately dry, and moistened with partial sweatings.

In general respiration is not much disordered in the early and incipient stage of the complaint; and it is only when the disorder has subsisted some time, softened the chord deeply and extensively, or the congestive irritation is seated in its cervical or dorsal region, that the motions of respiration become rapid, irregular, laborious, and inefficient, or slow, feeble, and panting.

The tongue is, in the early stage of the disorder, covered with a fur more or less thick and viscid, and which is white, or gray, and moist. As the disease advances this fur becomes more viscid, and is liable to be dried so as to assume a dry glassy appearance. Either as the disease proceeds, or in consequence of the employment of medicine, and the advance of the disease, the fur seems to disappear, and the surface of the organ becomes red, and apparently clean. But it is also smooth, dry, and glassy, and seems shrivelled, and the patient complains of constant thirst, until very near the close of the disease, when the sensations are blunted, impaired, and at length obliterated.

With the state of the tongue now mentioned, are associated the symptoms of perverted action of the alimentary canal, viz. hiccup, vomiting, flatulence, and constant or at least frequently-recurring diarrhoea, usually with a tympanitic state of the belly. It is on this account difficult to say whether the state of the tongue is dependent primarily on the condition of the spinal chord, or is connected with the disordered state of the villous membrane, and circulation of the stomach and intestines. It is possible that the latter may be the case.

Deglutition is in some cases difficult and painful, especially towards the close of the disease (*Dysphagia*); and as the suffering on attempting to swallow fluids is in some instances great,

and the attempt is followed by spasmodic action of the pharynx and œsophagus, it has been said that, in certain cases, symptoms of *hydrophobia* (Joseph Frank and Ollivier) take place. Hydrophobia is itself a mere symptom, and as such may occur; but it is most commonly the mere aggravated variety of painful *dysphagia*.

As the *paraplegia* comes on in different modes, varies in degree, and assumes different forms, it has been naturally imagined that these variations were connected with variations in the part of the spinal chord affected, variations in the extent of the disorder, and variations in the mode of its progress. Thus it has been thought that, when the lower extremities were unequally paraplegic, or when one was earlier paralytic than another, the inflammatory disorganization had first and most completely affected that side of the chord corresponding to the most paralytic limb. It has been already said, that when the myelitic softening is seated in the dorsal or lumbar portion, the lower extremities are alone affected, and when in the cervical or upper dorsal, the upper extremities only are paralytic. Though the former proposition is very generally correct, the latter is not equally so. Paralysis of both upper and lower extremities may ensue when the cervical and dorsal portion of the chord is softened, and the lumbar not affected; and this I have seen chiefly where the softening was so complete as to destroy in its whole thickness the spinal chord.

It has been further believed, that it is possible to trace a constant relation between the depth of the softening, and the fact of *paraplegia* with insensibility, or sensibility without *paraplegia*. Thus it has been thought, that when the limbs are paraplegic without change in sensibility, the inflammatory softening affected the anterior portion of the chord without touching the posterior, and conversely, that, when insensibility or *anaesthesia* took place without palsy, the lesion was confined to the posterior parts of the chord, and did not extend to the anterior, or the roots of the anterior nerves. Bellingieri, again, without actually questioning the accuracy of the inferences now stated, deduces from his experiments and observations the inference, that in simple *anaesthesia*, or loss of sensation, the lesion is situate in the gray matter of the chord; that in palsy, or loss of motion, the white matter is injured or destroyed; that in palsy, with *anaesthesia*, both white and gray matter are affected; that when the patient

presents symptoms of opisthotonos, the posterior strands of the chord are the seat of lesion; and that when the muscles are spasmodically inflected and adducted, the lesion affects chiefly the anterior strands of the chord and their attached nerves. He admits, however, with Sir Charles Bell and Majendie, that in all lesions of the posterior strands of the chord and their attached nerves, sensibility is impaired or abolished.

It cannot be denied, that, whether from the circumstance, that very rarely if ever, is only one portion or surface of the chord injured without one of another, or from the fact of the complication and mutual connection of all the parts of the nervous system, these inferences have not yet acquired that degree of precision which makes them applicable to pathological reasonings. It is nevertheless important to bear them in mind, in order to ascertain to what extent they are susceptible of application in diagnosis.

Joseph Frank mentions among the symptoms of the disorder occurring in infants, the involuntary and spasmodic inflection or incurvation of the thumb into the palm, and occasionally of the fingers, and their rigid separation from each other. This is only another proof of the justice of the statement already made, that he confounds under the general name *Rachialgitis*, inflammation both of the membranes and the chord. The symptom now mentioned, which was first well described by my late friend, Dr Kellie of Leith, I have seen in infants evidently labouring under spinal irritation, in consequence of affection of the membranes alone.

DURATION.—All the writers who have treated of this disorder have evidently, in speaking of its duration, confounded it with spinal *meningitis*. Thus Hildenbrand states, that about the seventh, ninth, and fourteenth day, either the inflammation is resolved by profuse sweating, hypostatic urine, or hemorrhage from the womb or the hemorrhoidal vessels, or it terminates fatally. Ollivier again states, that it most frequently terminates fatally from the third to the fourth day. I do not believe that any case of spinal inflammation terminates in so short a space of time as either of those now specified. Even when the disease is the effect of concussion and fracture of the *vertebrae*, it is seldom over in less than eight or nine days, and in a case in which this result succeeded fracture of the cervical *vertebrae*, the fatal event took place on the eleventh day. In the

similar case of Chevallier, it occurred on the fifteenth day after the accident; and Maccari saw a patient perish under similar circumstances on the eighteenth day after the injury.

In ordinary circumstances, however, and when the disease comes on spontaneously, or at least without external violence, it advances much more slowly, and a longer time is occupied before it proves fatal. In the first of the two cases published by myself, the patient was forty-two days in hospital before death, and previous to admission she had laboured for months under feebleness of the lower extremities. In the second, in which the disease seemed to follow external injury,—about six months after the lower extremities began to be affected with the incipient sensation of approaching paraplegia; but three months elapsed between that time and death. In a third case, in which the disease could not be ascribed to any external injury, it occupied between five and six months in proceeding to its fatal termination. In a fourth case, well known to me, it occupied not less than seven months.

It has been said by others that the part of the chord in which the disease most speedily proves fatal, is when it is seated in the dorsal region of the chord. But this must be a mistake. Judging from the comparative rapidity of cases in which the disease succeeds external injury in the different regions of the spine, the part in which its presence is most speedily fatal is the superior cervical and the cervical region.

In those cases in which the chord is divided partially or completely by a musket or pistol-ball, or in which it is crushed by a gunshot wound, though death is much more speedy, yet it generally takes place not earlier than twenty-four or thirty hours after the injury. In the case of the late Sir A. Boswell, in which the spinal chord was wounded in the neck, death took place the following day; and in the instance of the sergeant-major of the 5th Dragoon Guards, shot by a private in 1835, fever took place on the fifth day after the injury, and death on the eighth day.

The disorder may be regarded as acute when it terminates in from eight to fifteen days; as subacute when it terminates in from fifteen to thirty or thirty-five; and as chronic in all longer periods.

In the chronic form of the disorder the chief circumstances demanding attention are the slower and more insidious progress of the symptoms, the obscurity and uncertainty of their charac-

ter, and their greater variety and less degree of uniformity. Ollivier expresses the opinion, that, in the chronic state, its symptomatic effects on the thoracic and abdominal organs cause several of those peculiar spasmodic phenomena which have been commonly described as nervous or hysterical. Thus, he thinks, it produces in the heart and lungs, fits of palpitation, panting and suffocation, the idiopathic asthma of authors, and the assemblage of symptoms named *angina pectoris*, or breast-pang ; and in the abdomen, cramps of the stomach, colic-pains, painful drawing of the abdomen, or constriction of its muscles, constipation, and various derangements in the urinary secretion. I have only one question to propose on this point. Should not these phenomena be ascribed rather to the state named spinal irritation, than actual inflammation of the chord ?

PROGNOSIS.—*Myelitis* is very generally a fatal disorder, but if partial, and taking place in consequence of disease or injury of the *vertebræ*, it sometimes terminates in resolution and partial recovery.

ETIOLOGY.—Excepting such manifest causes as blows, falls, wrenches, and similar injuries, the presence of disease of the *vertebræ*, (*caries*), or inflammation of the articular processes, it is difficult to recognize with precision either the presence or the nature of those circumstances which operate as causes. The following, however, have been enumerated as most usual ; the strumous diathesis, rheumatism, or the rheumatic diathesis, the influence of the syphilitic poison, mercurial poisoning, exposure to excessive heat, sexual excesses, more especially the *venus onania*, and repulsion of cutaneous disorders. The rachidial arteries are often found diseased ; and this circumstance may be regarded as a very direct cause of *Myelitis emolliens*.

Induration of the chord is attended in general with the same symptoms, though less intense and advancing more slowly. The paraplegia is generally less complete, and partakes more of the character of rigidity of the limbs, and especially inability to extend them, than complete loss of power. It is generally associated with increased vascularity and thickening of the membranes, and preternaturally firm adhesion to the chord.

Atrophy.—The spinal chord is liable to become unusually small and shrunk, sometimes shortened, a little firmer than usual, occasionally softer than usual. To this state, which is very constantly associated with the presence of a considerable quantity of

serous fluid within the spinal theca, and not uncommonly thickening of the membranes, the name of *Atrophy* has been applied. Though this has been by almost all writers, and among others by Ollivier, regarded as a primary affection of the spinal chord, to me it appears, that all the circumstances of its history show, that it ought to be regarded as the effect of disease of the membranes. In their vessels accumulation and congestion takes place from various causes; serous or sero-albuminous fluid is secreted; and this pressing the chord prevents its further growth, or may even cause absorption and shrinking of its parts.

This change may either take place in early life, in consequence of spinal meningeal inflammation terminating in *hydro-rachitis*, when it arrests the growth of the chord, which consequently remains much in the same state in which it was at the period at which the disorder commenced;—or it may take place in adult or advanced life, when it is always connected with, and arises from, chronic inflammation of the membranes, and a slow or impeded state of their circulation; and the gradually increasing amount of the fluid compresses the chord, impedes its circulation and nutrition, and causes shrinking and absorption of its parts.

The chief reason for noticing Atrophy in this place is, that it gives rise to similar loss of power in the lower extremities to that which is observed in cases of softening. It may also be associated with myelitic softening.

Lastly, It is sometimes observed that various morbid states of the spinal chord and its membranes, especially the latter, give rise not only to paralytic loss of command over the lower extremities, with or without insensibility (*anaesthesia*), but to various other anomalous nervous symptoms. Of these the principal are tetanic symptoms, epileptic symptoms, choreiform symptoms, hysterical symptoms, and cataleptic symptoms. I have elsewhere described,* as an example of irritation of the cerebro-spinal axis, the case of a young man in whom epileptiform tetanus terminated eventually in epileptic fits, which were only subdued by repeated blood-letting, evacuants, and the use of indigo. In most cases of chorea there is strong reason to believe, that the spinal *meninges* are overloaded, their vessels injected, and that the spinal chord is thereby unduly irritated. Finally, the disordered state of the circulation in the spinal chord in many of the anomalous forms of hysteria, is, I con-

* Edinburgh Medical and Surgical Journal, Vol. xlv. p. 322, &c.

ceive, sufficiently established by the history of that assemblage of symptoms called Spinal Irritation, by the painful sensations in various points of the back, by the painful sensations in various parts of the trunk, and by the improvement almost always effected by evacuating and revellent remedies over the spine. It is requisite to observe, however, that the state now referred to is not one of inflammation or even mere congestion, but irritation of the chord and its nervous branches, in consequence either of too much slowly moving blood in the rachial vessels, or in consequence of their containing blood not sufficiently decarbonized, and, consequently, acting as an irritant poison.

DIAGNOSIS.—Myelitis and Myelitic paraplegia must be distinguished from the effects of rheumatism, from spinal irritation, (*Rachialgia*), lead palsy, palsy after pregnancy, and the loss of power arising from abdominal disease, (*Paresis*), and general weakness.

THERAPEUTIC INDICATIONS.—The great object in all cases of suspected or evident inflammation of the spinal chord, is to employ with activity and promptitude all the means calculated to abate and subdue the inflammatory action. These are blood-letting, general and local, revellents, as rubefacients, epispastics, and caustics over and along the course of the spine, cathartics, restrained diet, and rest in the horizontal posture.

After one general blood-letting, the most appropriate remedy is local blood-letting by means of twenty-four, thirty, or forty leeches applied several times along the course of the spine, or by repeated cupping and scarifying. If the lower extremities and pelvis only are paralytic, while the upper extremities are unaffected, it may be presumed that the seat of disorder is the lower dorsal portion and lumbar, and it will be proper to apply twelve or fifteen leeches on each side of the spine, from the sixth dorsal to the third or fourth lumbar vertebrae; and to repeat the evacuation in the course of a day, according to its effects and the symptoms. The remedy must be afterwards repeated according to its effects.

Revellents are highly necessary, and always beneficial, at least after depletion, and in the chronic form of the disorder. A large blister over the spine, or cauterizing the spine on each side by means of the butter of antimony, caustic potass, moxa, or the actual cautery, will be advisable.

Cathartics are of indispensable benefit,—in the commencement of the disorder to diminish plethora, remove the irritation of excrement, and prevent accumulation when the bowels are inert and torpid, and afterwards to prevent tympanitic distension, irritation of the villous membrane and follicles of the intestines, and the supervention of diarrhœa. Calomel and croton oil, or calomel, aloes, and colocynth, followed by the saline infusion of senna or oil of turpentine, are the best eccoprotics at the commencement of the disorder; and afterwards the compound colocynth pill, castor oil, with or without croton oil, and terebinthinate enemata are the most suitable agents.

The moment that symptoms indicate the presence of myelitic inflammation, whatever be the cause, whether inflammation and caries of the vertebræ or not, it is indispensable to place the patient in the horizontal posture, and to that to confine him strictly. At the same time care should be taken to observe whether lying on the back causes pain in any part of the spine; for it sometimes causes gnawing uneasiness in the lumbar region; and if this be the case, it will be proper to support that part by a firm convex pillow, unyielding, but not irritating.

Various applications to the paralytic limbs have been proposed in the treatment of this disorder. Of this nature are the stimulating embrocations and liniments, as ammonia, turpentine, various substances containing mustard, hot salt brine, blisters, stinging with nettles, electricity, galvanism, and similar methods of application. The employment of all these agents proceeds on an erroneous principle, since the source of the disorder is seated not in the paralytic limbs, but in the spinal marrow and the nerves thence proceeding. Their employment is further inapplicable, in so far as, by their use, it is proposed to stimulate to action organs which may indeed be stimulated, but the action of which it is physiologically impossible to place under the control of the will, so long as their central portion is diseased, and the link between that central portion and the ramified parts or those distributed to the muscles, is interrupted or imperfect.

It is true, that, under certain circumstances, the employment of these remedies seems to be followed by beneficial effects. But these effects are to be ascribed to their revellent or derivative power, by reason of which, by the artificial creation of superficial irritation and inflammation, they occasionally diminish the deep-seated morbid action. On this principle, however, these revel-

lent agents ought to be applied as near as possible over the seat of the morbid action.

St Ignatius bean and strychnia, leopard's-bane (*Arnica montana*,) the flowers of the poison oak, and similar agents, have also been employed with the view of rousing the paralytic limbs to action. These remedies may be given internally in the usual doses, watching attentively their physiological effects. The strychnia is further applied endermically. The same cautions are requisite in their employment in this disease, as those already specified in the treatment of cerebral softening.

It is further requisite to alleviate, to counteract, or to remove various disagreeable or painful symptoms, which result indirectly from the state of the spinal marrow and the condition of the patient. Thus, in consequence of the loss of power of the abdominal muscles, and the muscular coat of the intestines, the contents of the latter are not expelled, and being retained are a source of irritation. It is hence requisite to have recourse to stimulant enemata pretty often; and of these the most convenient next to the common domestic enema of gruel and salt, are turpentine, either alone or with aloes, and the saline infusion of senna. In consequence of the paralytic state of the muscular coat of the bladder (*detrusor urinæ*) the patient is incapable of expelling its contents, and it is requisite to introduce the catheter from four to six times daily to prevent overdistension. If this be not done, the same evil consequences, which have been already described under the head of *Encephalitis*, will inevitably ensue. Lastly, in consequence of the languid state of the circulation in the extremities, and the long continuance of the patient in the horizontal position, the parts of the skin, on which the person rests, are liable to become reddened, inflamed, and finally mortified. In order to obviate this inauspicious result as far as may be practicable, it is requisite to diminish the effects of pressure by the application of various liniments, by the use of the camphorated saponaceous tincture, or the opiate saponaceous tincture, or even the soap plaster applied over the parts most exposed; by the use of an air pillow, or the occasional employment of the hydrostatic bed of Dr Arnott.

The urine is liable to undergo decomposition. In the first period of the disorder, it becomes unusually acid, and deposits lithate of ammonia; afterwards it is liable to deposit the triple

phosphate; and, in a few rare cases, it furnishes carbonate of ammonia. In general for the first condition, alkalis, especially bicarbonate of soda or potass, or the *aqua potassæ*, are the best remedies. Afterwards, when the second condition occurs, opiates, alternated with laxatives, the vegetable tonics, as bears whortle-berry, (*Arbutus uva ursi*), buchu leaves, (*Diosma crenata*), and *Pareira brava*, with chalybeates, are the appropriate means of remedy. In the third form of disorder mere chemical theory would suggest the use of acids. But this would be merely to act on an effect not on the cause, which is in all likelihood seated in the imperfect action of the kidneys, the undue retention of the urine within the bladder, and the impaired action of the alimentary canal. Vegetable diet and the mild fruits, with gentle tonics, promise the most probable means of rectifying the unnatural state of the secretions.

§ III. Quinsy. Inflammatory Sore Throat. *Angina Cynanche*, Sauvages and Cullen. *Synanche*, Græcorum. *Angina Inflammatoria sive Angina Vera Legitima*, Burserii.

Avis au Peuple sur sa santé, par S. A. D. Tissot, 2 tomes, 12mo. Paris, 1763. Advice to the People in general with regard to their Health. Translated by J. Kirkpatrick, M. D., London, 1765, 8vo, Chapter vi.—Holland, Dissert. Cynanche Tonsillari. Edinb. 1776.—Elsner, resp. Gunther, Dissert. de Glossitide sive Lingux Inflammatione. Regiomont. 1788.—Bloedau, Dissert. de Glossitide. Jenæ, 1795.—Engelhart, Dissert. de Angina Tonsillari, Londini, 1799.—Raggi Ragionamento Academico sulla Glossitide. Pavia, 1809.—Observations, Pathological and Practical, on a particular species of Quinsy or Angina, &c. By David Craigie, M.D. F. R. S. E. &c. Edinburgh Medical and Surgical Journal, Vol. xlii. p. 19.

Inflammation of the *Velum (Isthmitis.)* *Uvula (Staphylitis.)* Tonsils (*Antiaditis*), and Tongue. *Glossitis; Glossocèle; Paraglossa.*

THE disease denominated Quinsy or Sore Throat has been defined and arranged by nosologists in a manner not well calculated to convey a clear idea of its peculiar and distinctive character; and in the works of systematic and even practical authors, the nosological errors have generally been copied without correction, artificial and trivial distinctions have been made and repeated, and in no instance almost, except in the hands of Tissot and Borsieri, has a useful practical delineation of the disorder been given.

This is so much the more extraordinary, as we find that, among the writers of antiquity, two, viz. Aretæus and Cœlius Aurelianus, and among the moderns Sydenham, appear to have formed correct ideas on the nature, aspect, and tendencies of this disorder.

As the distinctions of our first nosologists, Sauvages and Cullen, fail to afford correct views of the pathological relations of this disorder, and as in the more recent arrangements of Young, Mason Good, and others, the distinctions and definitions, however plausible in speculation, do not appear to me to give a just idea of this disease as it occurs in practice, I shall, discarding all previous notices, endeavour to give a view of the disorder, such as I think I have met with it in practice in the average majority of cases.

I observe, in the *first* place, that the terms *Angina* and *Cynanche* have been employed to designate a considerable number of affections of the throat, agreeing only in the circumstance of sense of suffocation, or in some instances, painful and difficult deglutition, but differing in their seat, the nature of the morbid action, and in their pathological effects.

I observe, in the *second* place, that it has been too much the practice, both with systematic and practical authors, to represent the action of *Angina*, *Cynanche*, or sore throat, to be confined chiefly, if not exclusively, to the tonsils alone, or to the tonsils, palate, and *uvula*. In mild forms of the disease this may be the case. But very frequently the disease either speedily extends to, or at the same time affects the base of the tongue, and causes much swelling of that organ.

The disease denominated Quinsy or Sore Throat is peculiar in this circumstance, that it is sometimes so trifling as to require no medical assistance or peculiar attention, and in other cases it is so severe as to produce sudden and unexpected death. From a considerable number of examples of the disease which I have seen, I infer that this peculiarity depends on the fact, that it assumes three different forms. The first is a superficial inflammation, confined chiefly to the mucous membrane of the tonsils, palate, *uvula*, and *pharynx*. The second is a deep-seated inflammation, affecting not only the mucous membrane, but the substance of the tonsillar lobules, their submucous cellular tissue, and that of the palate and *uvula*. And the third is an ex-

tensive and deep-seated inflammation, affecting, with the parts now specified, the base of the tongue, and spreading by this not only laterally to the *rami* of the inferior jaw, but backwards and downwards to the *epiglottis*, and occasionally to the *glottis* itself.

In the former case the disease produces little inconvenience, and presents the usual characters common to sore throat, that is to say, a sense of soreness and tenderness of the mucous membrane of the palate, tonsils, and *pharynx*, with difficulty and pain of deglutition; and when the throat is inspected, which is done with comparative facility, the membrane is found red and diffusely swelled.

In the latter case, however, when the submucous filamentous tissue is affected, a much more formidable train of symptoms is observed. Not only is the patient totally unable to depress the jaw sufficiently to allow the throat to be inspected fully, but the tongue cannot be moved, deglutition is completely impracticable, and even thin fluids cannot be swallowed. When the attempt to swallow is made, they produce great pain, and are rejected through the nostrils. At the same time respiration, and especially expiration, is performed so completely by the nostrils, that the air is expelled from them with a forcible blowing noise. In this state, also, the patient, instead of speaking as in health through the throat, snivels or utters his speech in an inarticulate and painful manner by the nostrils, or, to speak more accurately, without the motion of the soft palate and *uvula*. With these symptoms there is generally conjoined a profuse secretion of *saliva* and ropy *mucus*, which, instead of being swallowed or coughed up, trickles incessantly from the mouth, so that the patient appears as if in a state of profuse salivation.

The symptoms now enumerated depend upon inflammation affecting not only the substance of the tonsils and the mucous membrane of the throat, but the whole submucous tissue of the *velum palatinum*, *uvula*, and pillars of the *fauces*, the substance of the tongue, especially towards its basis, and spreading thence on each side to the filamentous tissue under the angle of the jaw, and even to that communicating with the neck.

When the tonsillar and palatine mucous membrane alone is affected, the disease may be recognized by redness and diffuse swelling of these parts. The constituent glands of the tonsils are sometimes chiefly or alone affected; and then these bodies become so much enlarged as to project from the space between

the anterior and posterior pillars of the *fauces* (*isthmus faucium*), in the form of two globular or spheroidal bodies on each side, and occupy more or less completely the passage, pressing on the *uvula*, diminishing or obliterating the passage between the *uvula* and the lateral pillars, and giving rise to considerable difficulty of deglutition, and pain more or less constant, but much aggravated when deglutition is attempted. In this form of the complaint, however, as the base of the tongue is not very much swelled, the jaw may yet be depressed, deglutition is still practicable, and the patient swallows fluids, and even soft solids occasionally.

In the third form of the disorder, that, namely, in which the submucous cellular tissue is the seat of disease, not only are the tonsils considerably swelled, but the whole submucous and muscular tissue of the tongue and the submucous tissue of the lower jaw and lateral parts of the throat are diffusely enlarged, hard, and painful, so as to render it absolutely impossible to depress the jaw in order to inspect the throat; while the swelling of the base of the tongue prevents the patient from moving that organ backward or in any direction, and, consequently, from swallowing or speaking articulately. The *velum* especially is so much thickened, that it loses flexibility and pliancy, and can no longer in the motions of deglutition be reflected upwards to cover the posterior nasal cavities. As the disease proceeds, these parts become still more generally swelled, and so unfit to obey the action of the muscles of deglutition, that not only is the patient unable to swallow solids, but he cannot even get fluids to pass into the *œsophagus*; and when the attempt is made, they regurgitate by the nostrils. The irritation of the nasal mucous membrane, thus induced by the application of substances to which it is not habituated, gives rise to swelling of that membrane, and so far changes the voice, that the patient snivels and speaks inarticulately through the nose; or, in other words, is unable to speak by the throat, mouth, teeth, and lips. At the same time respiration is performed entirely through the nose, with such force, that in expiration each breath is forcibly expelled from the nostrils in a current sufficient to affect the flame of a candle or taper. An incessant and copious stream of saliva issuing from the open mouth, attending this variety of inflammation of the throat, proceeds partly from the morbidly increased secretion of the salivary glands and tonsils, and partly from the circumstance of the impracticability of swallowing the saliva as it is secreted, as in health.

To understand more clearly and fully, however, the effect of this disease in producing death, it is requisite to attend for a little to the mechanism of deglutition, and its influence in deranging that function.

During the act of swallowing, the base of the tongue is carried backwards, the *epiglottis* is depressed and placed over the upper aperture of the *larynx*, while the arytenoid cartilages are mutually approximated, and the glottis is shut, so as to prevent articles of food or drink from dropping into the *glottis*, the *larynx* is drawn upwards and forwards, the soft palate and *uvula* are drawn upwards, and applied behind the posterior opening of the nasal cavities, and the mass to be swallowed being deposited in the upper part of the *pharynx*, that part is contracted by the successive action of its muscular apparatus, and the alimentary mass is conveyed into the *œsophagus*.

In the disease of which I now speak, either the whole of the actions now specified are very much interrupted and impaired, or they are so completely impeded that deglutition is utterly impracticable. The body and base of the tongue, already much swelled, cannot be carried backwards; the *epiglottis* is incapable of being depressed, and inflected over the superior laryngeal aperture; the soft palate and *uvula* cannot be reflected upwards to cover the posterior aperture of the nasal cavities; the *larynx* cannot be elevated and drawn forwards; nor can the superior division of the *pharynx* be contracted by its muscular apparatus.

The result of this is, that both the secreted fluids of the throat and mouth, and any articles of drink, are either allowed to run over the throat without being conveyed by the tongue and *pharynx*, and, consequently, with the incessant effect of trickling over the *glottis*, and irritating its mucous membrane, or they are rejected by the mouth, or regurgitated through the nostrils, in consequence of the soft palate being no longer folded up like a protecting curtain to close their posterior opening, and prevent the introduction of articles of food and drink. At the same time, in consequence of the immobility of the tongue generally, articulate speech is completely interrupted, and the patient utters at first inarticulate sounds, and then speaks through the nose.

In consequence of this interruption of the functions of the tongue and *epiglottis* on the one hand, and those of the soft palate, *uvula*, and pharyngeal muscles on the other, a secondary inflammation is induced in two parts, namely, the nasal mucous

membrane and the *glottis*, which give a peculiarly complex and aggravated character to the disease. The inflammation of the nasal mucous membrane is simply painful to feel, and distressing to behold, in consequence of the peculiar character which it communicates to the respiration and voice; but it does not necessarily involve any result inconsistent with the continuance of life. The inflammation of the mucous membrane of the *glottis* and *larynx* is a much more serious circumstance; and unless moderated by art, or subsiding spontaneously under the retrocession of the original disease, it may very speedily prove the cause of inevitable death.

The membrane investing the arytenoid cartilages then becomes swelled, thickened, and vascular; at first dry, it becomes afterwards the seat of a secretion of viscid mucous fluid; the submucous filamentous tissue becomes swelled, and infiltrated with serous fluid; and as these two tissues, the mucous and submucous cellular, thus become inflamed and swelled, and their surface become covered by the morbid secretion, they encroach on and diminish the opening of the *glottis*, until it is so much contracted, as to be incapable of admitting of the alternate motions of inspiration and expiration. These motions then become limited, imperfect, and inadequate, and eventually frequent, hurried, and laborious. The motion of the blood through the branches of the pulmonary artery becomes impeded and retarded, and accumulation in the trunk of the artery and the right ventricle forthwith ensues. The cardiac contractions become frequent, quick, and feeble; and the patient dies of a species of secondary asphyxia,—chronic certainly in progress and duration, but not on that account less certainly fatal.

It may become a natural question, what is the precise pathological and nosological character of this disease? It can by no means be regarded as mere *Cynanche Tonsillaris* alone, for the affection of the tonsils is often very moderate; and supposing it were greater, it is trifling compared with the disorder of the parts forming the base of the tongue, the palate, the inner coverings of the inferior jaw, and the upper region of the *pharynx*.

If this disease has been confounded with Quinsy, I think it is certain that practical authors have not accurately marked its progress, tendency, and termination. Quinsy, or *Cynanche Tonsillaris*, it has been said, may terminate by resolution, or by suppuration and ulceration; and when quinsy proves fatal,

it is said that it does so by the pressure of so large an abscess, on the *larynx* causing suffocation, or by discharging its matter into the *larynx*.

The inflammatory disease now mentioned, if really an intense degree of quinsy, differs, however, entirely from that disease, as has been already seen by the parts in which it is seated, and still more so by its mode of termination. Suppuration is either a rare result, or takes place so slowly that the patient expires long before it occurs. Though I have witnessed only one fatal case of the disease, I conceive that the phenomena of that case sufficiently justify the inference that I now draw regarding the mode in which death is produced.

Nor can it with greater justice be regarded as referable to the disease styled *Cynanche Pharyngea* by Eller, Sauvages, and Cullen; since the affection of the *pharynx* is only one of several parts of the diseased action, and the inflammatory swelling extends both forwards and laterally. In the *third* place, it cannot be said to be an example of mere laryngeal inflammation, since it does not commence with this, and if treated with prompt, active, and seasonable measures, it could not induce the affection of the *larynx* at all.

This disease, indeed, is a remarkable instance of the difficulty, if not the impracticability, of referring some morbid actions with certainty to any individual tissue. In this instance it is neither the mucous membrane nor the submucous cellular tissue alone that is affected, but both. Nor does it affect the tonsils, the *velum*, and the *uvula*, separately or generally, nor the tongue, the sublingual or submaxillary glands, nor the pharynx, the glottis, nor indeed any separate part of the apparatus of deglutition, or respiration, or voice. But the morbid action invades at first the mucous, and especially the submucous and intermuscular filamentous tissue of the tongue, the *epiglottis*, the inner coverings of the inferior jaw, the tonsils, the palate and uvula, and the upper region of the *pharynx*, nearly at the same time and in the same degree, and then consecutively and secondarily, the laryngeal mucous membrane, where it covers the arytenoid cartilages, and constitutes the *glottis*, laryngeal ventricles, and vocal chords. In this manner the disease, which commences as inflammation of the tongue, tonsils, palate, and *pharynx*, terminates in *laryngitis* and *asphyxia*, slow, indeed, and progressive in its movements, but not less certain in its effects.

The disease, in the aggravated form now described, may be regarded chiefly as a species of *isthmitis* and *glossitis*, or inflammation of the throat and tongue,—an *Angina lingualis*. The reasons on which this opinion rests, have been already in a great measure assigned; but they may be shortly specified in the following manner. *First*, the painful tumefaction of the body, and especially the base of the tongue felt by the finger, which not only prevents the jaw from being depressed, but gives rise to swelling visible in the external surface of the neck. *Secondly*, the incapacity to move the tongue backwards and upwards in the act of deglutition. *Thirdly*, the incapacity to move the tongue in the nice and delicate motions required for articulate speech. And *fourthly*, the incapacity to contract the palate and *uvula*, and apply them over the posterior nasal aperture. These I conceive to constitute the essential characters of the disease, and they induce the others, which are therefore accessory (*signa epigenomena*,) viz. the regurgitation of fluids through the nostrils; the nasal respiration and voice; the inarticulate snivelling; the incapacity to reflect the *epiglottis*; and the consequent irritation of the *glottis* and arytenoid membrane.

Though I have denominated this lingual inflammation *Diffuse*, in contradistinction to that which is circumscribed, I do not thereby mean that it is *disjunctive*, or of the kind which produces suppuration and suppurative disunion of parts in preference to albuminous effusion and adhesion. That it may produce suppuration is probable; but the rapidity with which it proceeds to the fatal termination by affecting the *glottis*, must generally preclude this result. It consists chiefly in general tumefaction of the parts by excessive distension of their vessels, and effusion of sero-albuminous fluid, and serum into the sub-mucous cellular tissue.

PROGNOSIS.—The inflammatory *angina* may terminate, if mild, and if treated promptly, in resolution, or by the swelling gradually subsiding, and the parts recovering their pliancy and mobility. It sometimes terminates in partial or general suppuration of the tonsils. Lastly, it may terminate, as already mentioned, in the production of *laryngitis* and suffocation. The prognosis is more unfavourable when the tongue is affected than when it is not.

ETIOLOGY.—The ordinary causes of *angina* or quinsy are exposure to cold, especially cold applied to the throat or neck, or

to the feet when overheated. It may affect persons of any age under fifty or fifty-five, but is most common between twenty and forty-five. Though it takes place mostly in spring and autumn, yet it is often seen in particular winters when the vicissitudes are great, the weather mild and moist, and, consequently, plethoric individuals are liable to be overheated. It is never contagious, but seems sometimes to be epidemic.

One cause of quinsy, and especially of *glossitis*, requires here to be noticed; that is the presence of mercury, or any of the mercurial salts in the system. Persons when under the influence of this mineral, if exposed to cold, are very liable to have a severe attack of inflammatory *angina*, in which the tongue is very much swelled and protruded from the mouth, (*glossocoele*), while deglutition is impracticable, and a stream of saliva, more or less copious, issues from the mouth.

TREATMENT.—As this disease consists in inflammation of the tonsils, palate, *uvula*, and base of the tongue, the chief object to be kept in view is to employ means calculated to subdue inflammation, and, above all, to promote resolution. This is most certainly accomplished by the adoption of the antiphlogistic regimen and treatment in all its branches. But as it has been supposed that general blood-letting is unnecessary in this disease, that local bleeding is sufficient with the use of gargles and cathartics, it is requisite to specify, as distinctly as possible, the remedial measures to be adopted.

In many cases of quinsy, where the palate and tonsils are swelled, it is advisable, in the first place, to administer an emetic, so as to produce full vomiting; and after this to exhibit cathartics and employ astringent gargles. For the first object, a scruple of ipecacuan powder with a grain of tartrate of antimony, forms for an adult the most convenient means. After full vomiting has been thus produced and has ceased, six grains of calomel and a scruple of jalap powder made in an electuary with treacle or honey should be given, or three or four ounces of the saline infusion of senna may be administered and repeated in the course of an hour or two. A very useful gargle is alum, dissolved in infusion of roses, at the rate of two drachms of the former in the pound of the latter. This mode of treatment, however, is only calculated for the mildest cases. The ammoniated or hartshorn liniment, the camphorated liniment, a sinapism or a blister to the external surface of the throat, are

also much used as popular remedies, and sometimes with apparent benefit; but, excepting the latter, namely, the blister, none of them are entitled to the character of energetic remedies.

In more formidable cases, in which the tonsils are much swelled and project across the throat, where the palatine *velum* is swelled and the voice is nasal, and where deglutition is difficult and painful, the simplest and most efficacious method is a blood-letting from the arm, to the extent of sixteen, eighteen, or twenty ounces from an adult, or if the deglutition be not rendered less painful and more easy, the repetition of this evacuation to twelve or fifteen ounces more.

Still more requisite is this evacuation whenever the tongue is swelled, when the patient cannot depress the jaw, protrude the tongue or swallow, when saliva is issuing abundantly from the mouth, when fluids attempted to be drank are rejected by the nostrils, and when the voice is nasal. It is then requisite to detract instantly from the arm eighteen, twenty, or twenty-five ounces of blood; and, examining the symptoms about five or six hours after, it is necessary in general to repeat the evacuation to the extent of twelve, sixteen, or twenty ounces more. In general, after this has been done, the patient is able slightly to depress the jaw and open the mouth, the saliva ceases to flow out of the mouth, fluids are no longer rejected by the nostrils, and the voice is less nasal. The pulse also becomes less tense and full, and likewise less frequent, the face is less flushed, and the eyes less protruded.

Providing the degree of alleviation now mentioned be attained, the rest of the cure may be left to the employment of cathartics and diluents with low diet. But if there still be difficult deglutition or difficulty in depressing the jaw and protruding the tongue, yet with abatement of the febrile disorder, local bleeding, by means of leeches applied to the angles of the jaw, or the external surface of the throat, affords an effectual means of finally removing the inflammatory swelling. The opening of the ranular veins, an analogous method which was anciently practised, has been said to be an insignificant remedy; but there is no doubt, that, if they be made to discharge a sufficient quantity of blood, it cannot fail to have considerable effect in reducing the violence of the disease, especially after general blood-letting; and it is accordingly recommended as an effica-

cious remedy by Sir John Pringle (iii. §. 3), and Borsieri, the latter of whom properly advises that these veins be divided, not punctured merely, (Cap. xvii. §. 385.) In some intense cases of lingual inflammation (*glossitis*), it has been found requisite to make deep incisions into the substance of the tongue; and it cannot be doubted, that, in impending suffocation from great swelling of this organ, it is the duty of the practitioner, rather to have recourse to this bold practice than allow his patient to die. In general, however, if he adopt general blood-letting at a sufficiently early period, and carry it to a proper extent, this mode of local depletion will be rendered unnecessary.

Scarifications or incisions in the tonsils and palatine *velum*, are also recommended, and in the hands of a dexterous surgeon, and in mild cases of the disease, they may prove beneficial. In severe cases, in which the base of the tongue is much swelled, the jaw cannot be easily depressed, and the tongue does not admit of backward motion, it is, on the one hand, not very easy to scarify the tonsils or soft palate, and, on the other, the blood issuing from these incisions trickles down on the top of the larynx and *glottis*, and causes urgent symptoms of gasping and suffocation.

If, under the use of the remedies now mentioned, the tonsils, palate, and tongue continue still swelled, then one of three evils may be dreaded. Either the patient may be suffocated by the inability to move the tongue, palate, epiglottis, and glottis, or suppuration may take place in the tonsils, or the swelling of the tongue gradually subsiding, that of the tonsils continues, with considerable hardness, and the disease assumes a chronic form.

In the first case it is difficult to say what should be done beyond local depletion by means of leeches, opening the ranular veins, or making deep incisions in the base of the tongue. Some recommend the inhalation of warm water containing sulphuric ether, with the double intention of relieving the difficulty of breathing and deglutition, and exciting the parts to so much contraction, as to cause the rupture of the tonsils if suppurating, or if not, at least the excretion of quantities of viscid mucus. This I have seen certainly beneficial, but it is a measure on which little reliance can be placed. Chloric ether is recommended in the same disease by the American physicians as a grateful and soothing stimulus.

When the tonsils threaten to suppurate, little can be done except leaving them to time. The abscessis generally disposed to burst spontaneously; but if it shows no tendency to this, the tumour may be punctured by the lancet.

When the tonsils become hard and continue enlarged, they do not always cause much inconvenience, unless when they are so swelled as to press on the orifice of the Eustachian tubes. The frequent application of the solid nitrate of silver is the most effectual and convenient remedy.

The state of the alimentary function must be carefully regulated, by the skilful exhibition of laxatives, tonics, and alkalies.

§. IV. Parotid Inflammation. Mumps, Eng. Branks, Scot. *Cynanche Parotidæa*, Sauvages and Cullen. *Angina Parotidæa*. *Tumor Glandularum Parotidum et Maxillarum*, Burserii. *Parotis*, Ploucquet. *Sialadenitis*, Hildenbrand. *Oreillons et Ourles*, French. *Orecchioni*, Tuscan. *Gotoni*, Bologna and Romagna. *Gotazze*, Genoa. *Bauernwetzeln*, German; *Topzel*, Germ.

Avis au Peuple sur sa Santé, par S. A. D. Tissot. 2 tomes 12mo. Paris, 1763. Advice to the People in general with regard to their Health. Translated from the French edition of Dr Tissot's *Avis au Peuple*, &c. By J. Kirkpatrick, M.D. London, 1765. 8vo. pp. 608. Chapter vi. §. 116. Rochard apud Journal de Medecine, Tome vii. p. 319, describes it as observed in Belle-Isle, where he represents it to be endemic.—Osservazione de Targioni Tozzetti. Prima Raccolta d'Osservaz. Med. p. 176.—Joan. Bapt. Burserius de Kanilfeld, Institut. Medicinæ Practicæ, Vol. iii. Lipsiæ, 1787, cap. xvi. §. 356, gives three cases at §. 363—An Account of a Distemper by the common people in England vulgarly called the MUMPS. By Robert Hamilton, M.D. F.R.S.E. F.R.C. Physic. Ed. Read Aug. 5, 1773. (Transactions of Royal Society of Edinburgh, Vol. ii. Art. ix. p. 59. Edin. 1799, 4to.)—Jacobi, Dissertatio de Angina Parotidæa. Goettingæ, 1796. Metz, Dissert. sistens Anginam Parotidæam. Wurceburgi, 1801.

SWELLINGS, more or less extensive and prominent, and accompanied in general with pain more or less acute, are observed to take place in the angle of the jaw, on one or both sides, in the region of the parotid gland, in the submaxillary space in the region of the submaxillary glands, and sometimes in the region of the sublingual glands. The most usual site for these swellings is the parotid region; and hence the disease has generally been regarded as consisting in inflammation of the parotid gland, and from its effect in impeding depression of the jaw or deglutition, it has been named *Angina parotidæa* and *Cynan-*

che parotidæa. Not unusually the swelling in the parotid region is attended with painful swelling in the submaxillary region, and less commonly in the sublingual region and glands.

This disorder, therefore, may be regarded as an inflammatory affection of the salivary glands principally; and hence it has been not improperly named by Hildenbrand *Sialadenitis*, (*σιαλον, saliva, αδην, glandula.*) It must not be imagined, however, that the salivary glands are alone, or even much affected in all cases of this disorder. The surrounding filamentous and adipose tissues are invariably much inflamed, and in the majority of cases the great part of the swelling appears to depend on the affection of these parts.

Inflammatory enlargement of the salivary glands and adipose membrane may be regarded as of three kinds, according to the circumstances under which it takes place. The first is the idiopathic or primary or pure inflammatory parotid; the second is the secondary or febrile, that, namely, which takes place in continued fever, typhoid fever, remittent fever, and pestilential fevers; the third is that in which enlargement takes place in consequence of strumous action, the use of mercury, the operation of the syphilitic poison, chronic inflammation, or schirrous action. The first is the only form which demands attention here.

This generally comes on with the usual symptoms of fever and catarrh. The patient feels cold or shivers, and has wandering pains in the back, trunk, and limbs. At the same time he feels some stiffness and soreness about the neck, throat, and angle of the jaw, which cannot be depressed so as to open the mouth, without pain and uneasiness. Shortly, swelling is observed at the angle of one jaw, and increases often very speedily with great pain and tension, and sometimes redness of the surface, while it extends not unusually to the submaxillary glands, and to the lymphatic glands of the neck, causing general enlargement of the whole of one side, with very considerable deformity. Similar swelling may, at the same time, affect the opposite side, so as to cause great deformity of the face and neck. In some instances, soreness of the internal fauces, and swelling of the tonsils, add much to the sufferings of the patient.

The pulse is quick, generally from 80 to 100, tense and full; the tongue furred; the skin is dry, and the patient complains much of thirst. At first the salivary secretion may be augmented (*sialorrhœa*); but afterwards, especially if the inflammatory

swelling and pain be considerable, it is diminished or suppressed (*sialischesis*.)

In general the swellings continue to increase till the fourth day, when they either stop or decline, with diminution of pain, stiffness of the parts, and immobility of the jaw. In this mild form the patient complains little, and is seldom confined to bed, and the whole course of the disorder is finished in seven days. In cases of greater severity, with much swelling and pain, about the fifth or seventh days the febrile symptoms appear to be considerable with evening accessions, and the disorder may be protracted, as it was in the Bologna epidemic, to the ninth, eleventh, or fourteenth day. (Laghi.) In other cases, which must be both severe and uncommon, it has been said to be continued for four weeks, and then to have subsided with subsidence of the parotid tumours, under sweating, a secretion of urine or spontaneous epistaxis. It appears, however, never to terminate fatally, however severe be its symptoms. The most favourable mode of termination is by the discharge of moisture from the tumours, and the surface of the body in general.

As the painful swellings in the parotid and submaxillary regions subside, swellings are occasionally observed to take place in the testicle and scrotum of males, and in the female *mamma* and *vulva*. It is also supposed that there is tumefaction in the ovaries of the female. In other cases, as the parotid and submaxillary swelling subsides, severe and obstinate vomiting comes on, or headach and convulsions with delirium, and in some instances general anasarca takes place. All these morbid phenomena are regarded as instances of metastasis. The metastasis to the genital organs is harmless, and usually subsides spontaneously. That to the stomach, brain, or kidneys is of a more serious description.

Dr Hamilton saw cases of this disease in which the metastatic swelling to the *testes* was followed by shrinking to an unusual extent of these bodies, and finally wasting or atrophy.

Tissot describes shortly an epidemic parotid disorder, in which a cutaneous efflorescence took place, appearing between the first and sixth day, terminating in desquamation of the scarf skin, (§. 117,) and often accompanied with a miliary eruption. There seems to be no doubt that this was an epidemic of scarlet fever. It has, however, received from Sauvages a place in his Nosology under the title of *Cynanche purpuro-parotidæa*.

ETIOLOGY.—This disorder prevails in the winter or spring, and is epidemic in certain seasons, and endemial in various dis-

tricts, liable to much humidity, and to currents of cold air. It may appear without any previous indisposition of the frame, but most frequently takes place after the person has been overheated, and suddenly exposed to cold air, or has drank cold fluids of any kind. It is more frequent in young persons, especially boys and young men, than in the aged, yet sometimes attacks aged persons. Hildenbrand ascribes its occurrence to the same causes as those which produce rheumatism.

TREATMENT.—This disorder, running a determinate course, and terminating very generally in resolution or metastasis, has been supposed to require little active treatment; and, in point of fact, it has very generally been left almost to nature and confinement in the house, with the use of gentle laxatives, diaphoretics, and diluents. It has been supposed that local depletion is unnecessary or hurtful. But if the pain be great, and the swelling considerable, it will always be proper to apply six or eight leeches, and to administer active doses of purgatives. Warm fomentations and relaxing emollient cataplasms are also very beneficial.

It is principally when the symptoms of headach and delirium indicate metastasis to the brain or its membranes, that it is requisite to employ active therapeutic measures. Blood should be drawn from the arm and from the head, the hair should be removed, and cathartics ought to be given, so as to act vigorously on the meningeal circulation. At the same time, it is believed to be important to endeavour to recall the swellings by the use of hot fomentations and stimulant cataplasms.

When the *mammæ* in females, or the *testes* in males, are swelled and painful, the best plan is to apply a few leeches, and afterwards warm fomentations and poultices.

In the case of vomiting coming on, it is said that sedatives and opiates are best, and that eccoprotics are unnecessary. This, I think, is doubtful. In the case of vomiting, if there be pain in the epigastric region, the best remedy is local bleeding by eight or ten leeches, or the application of a blister, and the use of such laxatives, either by the mouth or by enema, as will freely open the bowels.

Parotids in fever are usually bad symptoms. I have found them best treated by repeated local bleeding, and afterwards poultices. When suppuration threatens, incisions must be made.

A similar mode of treatment may be pursued in the strumous

enlargement; and afterwards blisters may be applied, and soda, potass, or iodine should be administered.

§. IV. Peripneumony, or Inflammation of the Lungs. *Pneumonia*. *Peripneumonia*, Sauv. gen. 112. Lin. 34. Vog. 51. Sag. gen. 311. Boerh. 820. Juncker, 67. *Peripneumonia pura sive vera Auctorum*, Sauv. sp. 1. *Peripneumonia gastrica*, Sauv. sp. 11. Morgagn. de Caus. et Sed. morborum, Epist. xx. art. 30, 31. *Pneumonia Biliosa*, Stoll et Auctorum. *Peripneumonia catarrhalis*, Sauv. sp. 6. *Peripneumonia notha*, Sydenh. sect. 6. cap. 4. Boerh. 867. Morgagni de Caus. et Sed. Epist. xxi. 11–15. *Peripneumonia putrida*, Sauv. sp. 2. *Peripneumonia ardens*, Sauv. sp. 3. *Peripneumonia maligna*, Sauv. sp. 4. *Peripneumonia typhodes*, Sauv. sp. 5. et Cappel. *Peripneumonia Nervosa*. *Amphimerina peripneumonica*, Sauv. sp. 15. *Pneumonitis*, Bourgard and Hildenbrand.

An Essay on Fevers. Second edition. By John Huxham, M.D. &c. London, 1752.—A Dissertation on Pleurisies and Peripneumonies, pp. 168 and 175.—An Account of the Diseases which were most frequent in the British Military Hospitals in Germany, from January 1761 to March 1763. By Donald Monro, M.D. London, 1764. Of the Peripneumony, 115.—*Istoria Ragionata dei Mali Osservati in Napoli, nello intero corso dell' anno 1764*. Par Michele Sarcone. Napoli, 1765. Parte Seconda.—Maximiliani Stoll. S.C.R.A.M. Cons. Nosocomii et Prof. Prax. Medicæ P. O. Pars Ima. III. IV. VII. Rationis Medendi in Nosocomio Practico Vindobonensi. Viennæ Austriæ, 1777–1778, 1780–1790.—Observations qui prouvent que la Pleuresie n'est pas une maladie essentiellement différent de la Peripneumonie. Par Antoine Portal, D.M. Memoires de l'Academie des Sciences, Paris, 1789.—Anatomie Med. T. V. Sachtleben Bemerkungen uber die Natur und Heilung der Brustentzündungen. Goet. 1790.—Kreysig Programmata de Peripneumonia, imprimis Nervosa. Vitemberg, 1800.—Horn, Ueber die Erkenntniß und Heilung die Pneumonie, Frankfort, 1802.—Maier, Dissert. de Peripneumonia thetica. Wirceburg, 1802.—Conradi Pneumonie und Pleuritis in nosologischen und therapeutischen Hinsicht. Marburg, 1803.—Ueber chronische Entzündungen, besonders der Brust und die davon herruhrende Lungenschwindsucht. Von Hofrath Dr Engelberg zu Donaueschingen. Hufeland's Journal, liii. 1821.—II. St. und St. VI. Seite 38.—Uebersicht der Neuern Fortschritte in der Lehre von den Lungenkrankheiten von Herrn Dr Romberg, Praktischen Aerzte zu Berlin, Horn's Archiv. 1822, Julius and August, seite 55. Andeutungen und Bemerkungen zur praktischen Medizin; von Dr Hans Adolph. Goeden. (Von den Wesen der gallichten Lungenentzündung, the nature of Bilious Pneumonia.) Hufeland's Journal, lv. St. iii. 68. 1822.—Die Lehre von den Lungen Krankheiten nach ihrem gegenwartigen Zustand u. mit vorzuglich Hinsicht auf die Pathologischen Anatomie dargestellt. Von D. C. J. Lorinser. Berlin, 1823. iii. S. 206.—Observations on the Peripneumonia of Children. By Thomas Cumming, M. D. &c. Transactions of the Association of King's and Queen's College of Physicians in Ireland, Vol. v. p. 28. Dublin, 1823.—Reports and Papers by Dr Graves and Stokes in Dub-

lin Reports and Dublin Journal.—Ueber die pathognomonischen Zeichen der Krankheiten und zunächst ueber die der Lungenentzündung. Von Dr Loewenhard zu Prenzlau. Hufeland's Journal, lxx. St. vi. Seite 3. Berlin, 1830.—Miscellen. aus dem Gebiete der Praktischen Heilkunde. Von Dr Hauff, Arzt. zu Besigheim. 5 Pleuritis und Pneumonia Biliosa. Hufeland's Journal, lxxix. iv. St. Seite 77, Berlin, 1834.—De l'Auscultation Médiate, ou Traité des Diagnostic des Maladies des Poumons et du Cœur, et 2d edit. deux forts vol. 8vo. Paris, 1826. 3ieme edit. Paris, 1831, 3 vols. 8vo. 4ieme edition avec des notes, par C. Andral, Paris, 1836. 3 vol. 8vo. Translated into English by Dr Forbes in 1821, 1827, and 1834. Chapter vi.—Ueber Pneumonie der Kinder. Von Dr H. Succow zu Bonn. Hufeland's Journal, lxxxi. 1835, v. St. Seite 95 —Observations on the Diagnosis of Pneumonia. By Dr Addison in Guy's Hospital Reports, No. iv. April 1837, p. 57.

It was a common practice among physicians to distinguish two forms of inflammation of the chest, one, *pneumonia*, or *peripneumonia*, affecting the lungs, the other, pleurisy, affecting chiefly, it was imagined, the lining membrane named the *pleura*. This practice was adopted more or less implicitly by nosological and systematic authors. Sauvages, for instance, in his Nosology, referred pleurisy to the head of membranous inflammations, (*Phlegmasiæ Membranosæ*); and *Peripneumonia* to that of Parenchymatous Inflammations, (*Phlegmasiæ Parenchymatosæ*.) Sagar observed closely the same distinction; and Vogel also made two separate genera of *Pleuritis* and *Peripneumonia*.

Cullen was the first nosologist who departed from this method of distinction; and believing that, if there were a distinction in anatomical position, it was too delicate for practical purposes, he fixed on the term *Pneumonia*, or Pneumonic Inflammation, to denote all the inflammatory affections either of the viscera of the thorax or of the lining membrane of that cavity, and then distinguished the genus into two species, *Pneumonia Peripneumonia*, or inflammation of the lungs, and *Pneumonia Pleuritis*, or pleurisy. Cullen farther was inclined to deny the independent existence of what physicians termed peripneumony as inflammation of the substance of the lungs alone, and thought it probable that every acute inflammation begins in membranous parts, and that pneumonic inflammation begins in the *pleura*, because in all dissections marks of considerable affection of the latter membrane always appeared, and maintained that the term pleurisy might be with propriety applied to every case of the disease. From this it results, that the account given by Dr Cullen of pneumonic inflammation is a de-

scription rather of pleurisy or *pleuro-pneumonia*, than of *pneumonia* strictly so called.

The pathological views of Cullen were long followed by almost all British practitioners; and the only indication of the remains of the old doctrine was, that when pain of the side was prominent and urgent, it was allowed that the disease partook most of the character of pleurisy. Among foreign authors, Borsieri, and Peter and Joseph Frank adhered, with little change, to the views of Cullen; while Hildenbrand gave histories of pneumonia and pleurisy as two different disorders. I have already adverted to the difference of opinion among physicians as to the occurrence of pleurisy distinct from inflammation of the pulmonic substance. I have now to speak of the existence of pulmonic inflammation as distinct from pleurisy.

The dissections of Haller, (*Opuscula Pathologic. Observ. xiii. xiv.*) and Morgagni, (*De Sedibus, Causis Morbor. Epist. xx. and xxi.*), have been generally believed to prove, that the substance of the lungs may be inflamed without affection of their serous membrane. Portal's evidence, while it shows the inaccuracy of our semiography as to the kind of pulse and the pricking pain, establishes the same fact very clearly, viz. that the substance of the lung may be inflamed without affection of its investing membrane. Baillie, on the other hand, states, that inflammation of the pulmonic substance seldom takes place without some similar affection of the pleura; and that the membrane covering the inflamed portion of lung is crowded with fine red vessels, and is generally covered with a layer of coagulable lymph. This discordance may be explained by the fact, that inflammation of the pulmonic substance occasionally commences with the submucous cellular tissue, and shows less tendency to proceed towards the serous membrane than to extend through the proper pulmonic tissue; whereas in other instances it may extend to this membrane, and give rise to its usual effects. It is on this account that inflammation of the lungs appears occasionally as a bronchitic peripneumony, sometimes as a peripneumony, and at other times is the disease to which Huxham and Stoll and others have given the name of pleuripneumony, or pleuro-peripneumony. (Huxham, *Dissertation on Pleurisies and Peripneumonies*, Chap. ii. p. 175, &c. and Stoll; *Ratio Medendi, pars prima*, 146, 155; *secunda*, p. 155; *tertia*, 324.)

Amidst this discussion it is curious to remark, that the commencement of the disease in another part of the lung, the mucous or bronchial membrane, which is probably the most frequent, appears not to have been thought of. This oversight is to be ascribed to the habit of looking more to the serous or outer surface of the lung than to the mucous or inner; for it is a well-established fact, that pneumonic inflammation is a frequent consequence of catarrh, and that in persons dead of bronchial inflammation the submucous cellular tissue is very generally affected; and it may also be asserted, that it is rare to see the substance of the lung inflamed without extension of this process to the corresponding portion of bronchial membrane. For information on this head, I refer to what has been said on chronic catarrh.

The anatomical characters and morbid effects of inflamed lung have been mentioned by many authors, Morgagni, Stoll, Cullen, Carmichael Smyth, Portal, Baillie, Bayle, and lastly Laennec. *1st*, On opening the chest and admitting the air, though there are no adhesions, the lung does not collapse at all, or does so very slightly. *2d*, The pulmonic substance, when inflamed, becomes harder and denser than natural, and does not float completely in water. If the induration is considerable or extensive, it sinks entirely. *3d*, It loses its elasticity and compressibility, or cannot be inflated, and no longer crepitates as in the healthy state, but resembles a piece of solid flesh. *4th*, When divided by the knife, a portion of inflamed lung is very firm, its spongy or vesicular structure appears much redder than usual, the colour being chiefly florid but partly of a darker hue, and in general a white or yellowish fluid, somewhat frothy, flows from the cut bronchial tubes, while bloody serum may be observed to escape from the proper pulmonic cellular tissue.

This change in the pulmonic tissue was early observed by pathological anatomists; but we find the first distinct examples of it in the writings of Morgagni* and Maximilian Stoll,† the last of whom recognized it in many individuals who had laboured under chronic inflammation of the lungs. This change Dr Baillie ascribed to accumulation of blood in the minute vessels of the part, and effusion, or extravasation, as he terms it, of coagulable lymph in the cells of the submucous tissue.‡ This deposition

* *Sedibus et Causis*, Epist. xx. 3, 5, 22, 24, 20, 26, 36, 42, 47, 49, xxi. 26, 11, 27,

† *Rationis Medendi*, Pars i. 184, 202, ii. 370, iii. 364.

‡ *Morbid Anatomy*, p. 60.

obviously produces two effects on the structure in which it takes place. It unites mutually the individual fibres or threads of which the pulmonic cellular tissue consists, and, by its presence, diminishes the space originally occupied by the compressible and elastic substance of the organ. The authorities to whom I have now referred, notice this change as if it were peculiar to inflammation of the lung, acute or chronic; and, strictly speaking, it forms the pathological character of this disease. It is not, however, confined to it; for it was ascertained by Broussais, and afterwards by Hastings, that it is a common consequence or accompaniment of chronic bronchial inflammation.

Since the appearance of the writings of these authors, M. Laennec has described, under the head of peripneumony, three different degrees of it, and has distinguished them; 1st, according as the lung is red or violet, but crepitates and discharges, when cut, a frothy blood-coloured fluid; the stage of obstruction; 2d, as the portion of lung is destitute of crepitation, and is red and granulated interiorly, without discharge of fluid when cut, unless squeezed; the stage of hepatization or carnification; 3d, as it is consistent and granular, its section a pale yellow, a straw, or stone gray colour, and as it discharges a considerable quantity of opaque, yellowish, viscid fluid, from many points of its cut surface;—the stage of gray hepatization or purulent infiltration. In this state also the substance of the lung is friable and lacerable, and easily gives way.

Notwithstanding the great authority of Laennec as a pathologist, there is reason to believe that the first of these stages is preceded by one which is the proper morbid state of inflamed lung, and that the other three are merely effects or consequences of this inflammation. It is in the first that the proper pulmonic substance is penetrated with red blood in vessels which, during the healthy state, are colourless, and perhaps in newly formed vessels, before any new product is formed. In the second, or that of obstruction, blood and sero-albuminous fluid have been effused, and being extravasated into the filamentous tissue of the lung, give it the dark-red appearance and massy, consistent, oedematous feeling which it then presents. In the third, coagulation takes place, and communicates to the affected lung the granulated appearance and solidified consistence which Laennec improperly regards as characteristic of inflammation of the pulmonic tissue. It is characteristic merely of the effect of this inflammation, or the effusion and coagulation of the blood and

lymph. The third degree, or what I must call the fourth stage of the disorder, is manifestly an effect of inflammation; for Laennec himself admits, that the opaque, yellowish, viscid fluid, which is discharged from its cut surfaces, is purulent, though of a peculiar character, and constitutes, according to him, suppuration of the lungs.

Nor is the circumstance now mentioned important merely as a pathological principle. It exercises very great influence indeed, on the connection between the morbid process, and the symptoms of the disorder, and consequently is of great moment in fixing, regulating, and modifying all our therapeutic measures.

Laennec in his diagnosis of pneumonic inflammation has impressed the necessity of bestowing particular attention on the physical signs or those obtained by percussion and auscultation. These are certainly highly important, and ought not, in framing a diagnosis, either as to the presence, the extent, or the stage of the disease, to be overlooked. But it is not less important for the practitioner to know that they can be employed only in the second and third stages of the disorder, when the influence of treatment is always uncertain, that they are scarcely perceptible, and certainly not uniformly distinct in the first stage, at which time treatment is most effectual, and that, if the practitioner neglects the rational signs, or those derived from the observation of the feelings and complaints of the patient, and the mode in which respiration is performed, he will very often allow the time for active treatment to pass over unimproved, and have nothing to do, but contend against the disorganizing effects left by the disease.

After premising these observations, I shall endeavour to give a description of pneumonic inflammation, such as it is most commonly observed in the acute and simple form of the disease.

Pneumonic inflammation may come on in two different modes. Either its symptoms appear suddenly after exposure to cold, or after an individual has been labouring under cough for weeks, and going about, living in his usual mode, pursuing his wonted occupations, and neglecting his complaints entirely, these catarrhal symptoms are quickly succeeded by bronchitic symptoms, and those of pneumonic inflammation.

The first evident indications of the establishment of the disease, are either a distinct fit of shivering continued for one or two hours, or wandering chills lasting for a day or two, in which the patient seeks the fire, and takes warm drinks, yet can by

no means completely remove the sensations of cold creeping in various parts of the trunk and extremities. At the same time the breathing is short, panting, and irregular, the pulse is small, compressed, and somewhat more frequent than natural, and much general anxiety and uneasiness prevails.

As the sensations of cold subside, some degree of unusual heat succeeds, not uncommonly with partial sweatings about the head, neck, and chest, and these become more evident and profuse, though equally partial, as the disease advances.

It is then observed that the breathing is short, quick, from 36 to 40 in the minute, panting and laborious, and performed with more heaving of the chest than usual. Inspiration is short, and rapidly followed by expiration. Deep inspiration is impracticable, and is generally attended with a sense of weight or pain in some part of the chest, which even may be felt without deep inspiration. At the same time the patient feels the symptoms of uneasiness and weight, and oppression within the chest, aggravated by lying on one side more than on the other, in general on the side of the chest, the lung of which is affected; in other instances, in which it is believed both lungs are inflamed, he feels most relief in lying on the back; and in very intense forms of the disorder he is unable to lie in the horizontal posture, and is obliged, in order to be able to breathe, to observe a good deal of the erect posture.

In such circumstances, there is constant restlessness, uneasiness, and jactitation. The countenance is anxious, the face flushed, or brownish coloured and bloated, the cheeks may be livid, and very generally the nose and lips are livid; while the frequent motion of the nostrils (*alae nasi*) indicate the labour and panting of the respiration.

Pain is not constant. When present it is generally dull, with a sense of weight and oppression. When pungent and fixed in the side, it has been believed to denote a pleuritic unattended by a pneumonic affection; but this was shown to be a mistake by Portal, who gives cases in which, after severe pungent pain of the side, the substance of the lungs only was found to be affected.

Pneumonic inflammation is always attended with more or less cough, which is frequent and urgent, and dry, or without expectoration at the commencement, unless when the disease has succeeded catarrh of some continuance, when the matter expectorated consists of a little bluish or whitish mucus mixed with frothy fluid or saliva. As the disease advances, there is still

little expectoration, and even when it follows catarrh, the expectoration is suspended for a day or two. Afterwards, however, when the disorder is fully established, and where no remedies have been employed to moderate or subdue the inflammatory action, expectoration begins to take place; and the matters excreated are various. At first they are gray coloured, somewhat diaphanous, but so viscid and tenacious, like jelly, that they adhere to the sides of the vessel containing them, and are only slowly and with difficulty detached when the vessel is inverted. This viscid, jelly-like matter is generally mixed with air floating in some frothy fluid like saliva; but the former very seldom contain air-bells, yet it does not sink completely in water. As the disease advances and becomes more extensive, the viscid jelly-like matter becomes more abundant and thicker, sometimes more opaque, and acquires a yellow or orange coloured tint, or may be mixed or streaked with blood, or becomes of a greenish colour. The most common is, perhaps, the orange-coloured matter, (*sputa crocea*,) or what has sometimes been denominated rusty coloured *sputa* (*sputa ferruginea*.) That this is a secretion from the mucous membrane of the bronchial tubes, is clearly proved by this fact, that it is possible to trace the progressive changes from the diaphanous and bluish or gray-coloured jelly-like viscid mucus, to that which is first tinged or streaked with blood, and finally to that in which the viscid jelly-like mucus is so completely coloured, while, at the same time, it is thicker and more abundant that it acquires the orange or rusty colour, which has been supposed to indicate the most established stage of the disorder. It is in this state that it has been styled concocted (*sputum concoctum*.) This expectorated matter continues so long as the inflammatory congestion of the lung and the bronchial membrane continues, and only begins to change its characters, to become less orange-coloured, more gray, or bluish, or white, and to diminish in quantity as the inflammatory congestion subsides, and as the circulation in the lung is restored to its healthy state. In some instances in which the impediment to the circulation through the lungs is great, as indicated by the labour of the respiration, the lividity of the cheeks and lips, and the urgency of the cough, the expectorated matter contains much blood, or may consist of pure blood.

The disorder is attended with other symptoms, which being referable either to the symptomatic fever, or the influence of the diseased lung or lungs on the system at large, are account-

ed more or less secondary. Thus the face is flushed; the eyes glaring and suffused, occasionally lacrimating; the cheeks often covered with red or livid patches, and the whole countenance is expressive of anxiety and distress. The tongue is covered with a thick whitish or whitish yellow fur; the patient complains of unquenchable thirst, and in general the appetite is impaired or entirely gone. The belly is tense, and in the latter stage of the disease in constant motion, in consequence of the respiration becoming mostly abdominal and diaphragmatic. The bowels are constipated; the urine scanty, red, high-coloured, and hot to the feelings of the patient when voided. At the close of the disease it is turbid and deposits a reddish sediment. The pulse is always quicker than natural (90–104 in the adult, in children, 120–140), at first small and oppressed, then strong, hard, and full afterwards, when the respiration is very rapid, quick, small, soft and feeble, and sometimes irregular and intermittent. The cardiac impulse is at the same time strong and violent, often amounting to palpitation (*cardiopalmus*), and generally jarring. The blood when drawn in the established period of the disorder always presents a buffy coat, variable in thickness, generally very thick, and not unfrequently strongly contracted towards the centre or cupped. In the early stage at the first blood-lettings, the serum is natural in quantity, but afterwards, especially from the strong contraction and firmness of the clot, it is abundant.

With regard to the physical signs, or those obtained from auscultation and percussion, they vary in the different stages of the disorder. Laennec, who distinguished the disorder into the three stages of obstruction, hepatization, and purulent infiltration, represents the crepitous rattle as the pathognomonic symptom of the presence of peripneumony, and maintained that it is perceptible from the first invasion of the disorder. This sound, which he likened to the crackling noise of salts in a vessel exposed to a gentle heat, or that produced by blowing air into a dried bladder, or like that emitted by the healthy lungs previously distended by air and compressed by the hand, he ascribed to the pulmonary cells containing a watery fluid as well as air. Andral, in like manner, who admits this sound as characteristic of the first stage of the disorder in the majority of cases, also refers its seat to the pulmonic vesicles, which contain, he thinks, a muco-sanguinolent fluid, which is afterwards to become purulent, and regards this sound as a small or diminutive mu-

cous rattle. This idea of the crepitating rattle being characteristic of the early or first stage of peripneumony, has been very generally adopted by many physicians who have followed Laennec in the study of the stethoscopic signs.

I am nevertheless convinced, from examining carefully the respiration of a considerable number of patients who presented all the rational signs of the disease, that it is not present in the first stage, properly so named, and that when this sound is heard, it indicates that the disorder has either passed over the first stage, or is at the close of that stage, or is commencing the second stage of the disorder. If the respiration of a patient in the first or incipient symptoms of peripneumony be carefully examined by auscultation, all that can be heard is the air entering the large and middle-sized bronchial tubes, during very short inspiration, proceeding no farther, but instantly thrown back by expirations, which press as it were on the inspirations. The air of inspiration audibly does not penetrate the small bronchial divisions and the vesicles, for no vesicular respiration is heard, and all the respiratory sound is confined to the large and middle-sized bronchial tubes.

If at this period, while the respiration is very rapid and difficult, the pulse quick and full, and the cough frequent and urgent, but still dry, blood be drawn from the arm to the extent of twenty-five or thirty ounces, and twelve or fifteen ounces more in the course of eight, ten, or twelve hours, the respiration becomes slower, with full deep inspiration, the cough becomes less frequent, the pulse becomes less frequent, and softer, and fuller; and the disease, in short, subsides entirely without any other remarkable circumstance, and very rarely are any stethoscopic or auscultatory phenomena formed, excepting a little sibilous wheeze and mucous rattle, while scanty expectoration of mucus takes place. I know especially, from having repeatedly observed cases of this kind, and treated them in the manner now mentioned, that no crepitous rattle is heard in any part of the lung. I think it impossible to doubt, nevertheless, that such cases are genuine examples of pulmonary inflammation in the earliest stage, because if the depletory means specified had not been employed, the crepitous rattle would doubtless have been formed.

It is different, when, either from the circumstance of the patient, as is very often the case, not applying for assistance until the symptoms have continued for several days, or from the medi-

cal attendant refraining from active measures of depletion in the early stage, the disease has been allowed to proceed uncontrolled and unmodified. Then, indeed, the crepitating or crackling rattle begins to be heard generally in the lower part of the chest of the affected side. The sound is at this time various. In some instances it is like the crackling of salts thrown on a heated iron, but with a sound less clear. More frequently it resembles to my mind, the sound produced by rubbing several folds of stiff moist leather in a fluid against each other; and in either case the sound is dull, and masking or concealing completely the sound of the vesicular and small bronchial murmur. This sound I have in general termed moist coriaceous crepitant rattle, (*strepitus coriaceus humidus*.)

These different phenomena afforded by auscultation at different periods of the disease depend on different states of the lung. It is very true that the fatal event rarely if ever takes place in the first stage, so that it may be justly asked by what means can the state of the lung be known with precision. This difficulty may be obviated, however, by observing the sound emitted by lungs inflamed in different degrees. In all cases of pneumonic inflammation, different parts of the lung are in different stages of the process. The lower lobe, for instance, and the lower part of this lobe, are in a more advanced stage of the process than the middle lobe or the upper part of the lower lobe, and the lower part of the middle lobe, may be in a more advanced stage of the process, than the upper part of the same lobe. By examining stethoscopically the breathing in the different parts of a lung so inflamed, and comparing them with each other, and accurately recording the indications, especially if the case terminate fatally, it is possible to obtain clear and conclusive evidence that the part which is least inflamed has been in that state without giving rise to the crepitant rattle.

Examinations of this kind have satisfied me that the stage denominated that of obstruction is preceded by a previous stage, in which no crepitant rattle is heard; and I have, therefore, been in the habit of distinguishing the disease and its effects, so far at least as the physical signs are concerned, into four stages. The first of these is the disease itself, or the state of vascular injection and congestion of the lung, in which all the vessels are loaded with an inordinate quantity of blood, which is prevented from moving freely within their canals. The lung is consequently congested and tumefied, the blood does not circulate with its

normal freedom and velocity through the pulmonary artery into the veins, and respiration is consequently impeded, and its great purpose defeated. In this state of the vascular system of the lung, in which the capillary circulation is retarded, and is every hour becoming more slow and imperfect, and consequently increasing the congestion and swelling of the lung, consists the condition of inflammation strictly so called. All the other states which have been described as subsequent stages, are properly speaking, effects of this incipient or congestive stage.

It is important also in this inquiry to attend carefully to the texture of the lung affected, or, in other words, to the precise seat of pneumonic inflammation. That I have already stated is the proper substance of the organ, the *parenchyma*, as it is named, and which consists of filamentous tissue traversed by blood-vessels, and the vesicles or minute extremities of the bronchial tubes. This filamentous tissue, which is exceedingly fine and delicate, and unites together all the simple tissues which enter into the composition of the lung, becomes the seat of the vascular injection and congestion which constitutes pulmonic inflammation. But as the minute vesicles, or rather the extreme terminations of the bronchial tubes, are formed by a membrane, so thin and transparent, that, having this filamentous tissue as the submucous tissue immediately beneath them, they are, as it were, identified with it,—inflammatory congestion taking place in the filamentous tissue affects the vesicles either in its action or in its effects, and inflammatory action taking place in the vesicles passes speedily to, or affects at the same time, the pulmonic, filamentous, or parenchymatous tissue. It hence results, that every case of pneumonia presents more or less of the disease which I have named (Vol. i. p. 833—838,) Vesicular *Bronchitis*; and, indeed, this circumstance is intimately connected with that which I have already mentioned as attending the first onset of the disorder, that pneumonic inflammation most frequently comes on as a bronchial affection, or follows the symptoms of neglected bronchial inflammation; and if it do not follow vesicular *bronchitis*, the inflammatory congestion appears at the same time to attack and involve the filamentous tissue of the lung, and the mucous tissue of the ultimate bronchial divisions and vesicles.

The knowledge of these facts, which can be indisputably proved by examining the healthy structure of the lung, and the distribution and arrangement of the minute bronchial tubes, and

comparing this with the state of the lung and bronchial tubes and vesicles in inflammation, affords the means of explaining all the phenomena, both anatomical and pathological, as well as symptomatic of the disorder. They show at once the reason why the congestive stage takes place without crepitant rattle, and why the chief symptom indicating the presence of this stage is the short, checked inspiration, and the absence of vesicular or minute bronchial respiration.

The first of these effects of inflammation is the state of obstruction, which, indeed, is the close of the injecting or congestive stage. In this stage, the congestion or retarded motion has begun to produce some morbid secretion, and the most usual is either sero-sanguine fluid or *liquor sanguinis* effused into the parenchymatous or filamentous tissue of the lung. Even pure blood itself may be effused into the interstices or cells of this tissue, and though fluid at first it soon coagulates, and causes a peculiar red, firm granular appearance in the part thus infiltrated. At the same time, some serous or sero-mucous fluid may be effused into the vesicles and small bronchial tubes from their membrane; but this I believe to be a rare occurrence in genuine pneumonia, and to belong rather to that form of the disorder denominated *Peripneumonia Notha*, or bastard peripneumony. The crepitating rattle in pneumonic inflammation depends on the presence of serous, sero-sanguine, or sero-albuminous fluid effused into the filamentous or parenchymatous tissue of the lung, which, compressing the minute tubes and vesicles, obliterates them, and prevents the inspired air from penetrating them, or even entering further than the large and middle-sized bronchial tubes.

As the effusion of sero-albuminous, sero-sanguine, or bloody fluid proceeds, it undergoes separation into two parts, one spontaneously coagulable, the other more fluid. The former unites the interstices of the filamentous tissue of the lung into a solid mass, which is no longer soft and elastic, but firm, has a granular appearance when divided, and is friable. It is the presence partly of this effusion, and partly of the serous fluid separated from it that renders the chest dull on percussion in the third stage of pneumonic inflammation, and extinguishes entirely even the crepitous rattle, unless at its margins, and on the boundary between the consolidated portion and that which is still in the state of obstruction.

At the same time it sometimes happens that, when the disease

has not been treated actively, some mucous fluid or semifluid matter is expectorated; and in some cases the mucous rattle may be heard in various parts at the margins of the hepatized portion of lung.

Inflammation usually commences in the lower part of the lung, and generally attains there its greatest intensity. Thus, the whole of the lower lobe may be in a state of extensive induration and hepatization, while the middle lobe is only reddened and infiltrated with serum, sero-sanguine fluid, or blood, and the upper lobe is comparatively healthy. The centre of the lung also, especially opposite to the lower angle of the scapula, is often the seat of inflammation. Inflammation may take place in one lung or in both; and in the same manner it begins first, and attains its greatest intensity in the lower lobes of both. In the former case, it is said to be simple; in the latter, it is double pneumonia. It is not easy to estimate the comparative prevalence of pneumonia in either lung, or in both; but from the attempts made, it appears that pneumonia of the right lung is more common than in the left, in the ratio of more than two to one, and that single pneumonia is more common than double pneumonia in the ratio of six to one.*

It must not be imagined, however, that inflammation is always seated in the lower part of the lung. Morgagni, Frank, and Broussais often found the upper part of the lung inflamed; and in the summer of 1837, I found with Mr Watson, in the body of a woman who had died rather suddenly, the upper part of both lungs in a most complete state of gray hepatization. Dr Alison, to whom I mentioned this fact, has also observed its occurrence. The same is admitted by Andral, who allows that it is not uncommon, and by Chomel, whose experience led him to regard it as frequent.

TERMINATIONS.—Pneumonic inflammation may terminate in, 1. resolution, perfect or imperfect; 2. in sero-sanguine effusion, causing œdema of the lung; 3. in effusion of blood, causing red induration, consolidation, or simple hepatization (*scleroma*); 4. in red softening (*malacismus*); 5. in effusion of blood and lymph, causing granular hepatization; 6. in effusion of lymph, causing gray induration or hepatization; 7. in pleuritic exudation (*empyema*, *pyothorax*); 8. in purulent infiltration, and friable soft-

* Of 210 cases of pneumonia, 121 were in the right lung, 58 in the left, 25 double, and 6 not ascertained.

ening; 9. it may become chronic, or terminate in mixed hepatization; or, 10. it may terminate in gangrene.

Resolution is that termination which takes place either spontaneously or under the use of remedies, when all the symptoms gradually disappear, and the patient is restored to the use of his lungs, without chronic cough, expectoration, or any unfavourable result.

Simple hepatization is perhaps not a termination of peripneumony unless when the inflammation is extremely intense and the disease is rapid, or when it is chronic and insidious. Cullen remarked that pneumonic inflammation may terminate in a peculiar manner by effusion of blood into the pulmonic cellular texture, which soon interrupting the circulation produces fatal suffocation. (259 and 346.) The same fact is noticed by Carmichael Smyth and by Portal. And this effusion is evidently the ulterior stage of the first degree mentioned by Laennec, combined, perhaps, with part of the second; and according to this author, death may take place before the fourth part of the lung is affected by inflammation. This is the red hepatization of Andral.

Cullen remarked, (348), that in persons who have died after labouring under pneumonic inflammation for a few days only, the bronchial tubes are found filled with a considerable quantity of serous and thickish fluid. He thought that this was derived from the fluid effused into the pulmonic tissue, and that fluid expectorated when copious proceeded from the same source, because it is difficult to suppose them to proceed from the mucous follicles of the bronchia. It is to be remarked, however, that from the sound state of this membrane, no conclusion can be derived regarding its condition in disease, and there is no doubt, from the history formerly delivered of bronchial inflammation, that the discharge from this membrane may be very copious, and more especially at the termination of pulmonic inflammation. It is also to be borne in mind, that pneumonic inflammation is always connected with more or less vesicular *bronchitis*; and it is impossible to doubt that the effusion now mentioned as found within the bronchial tubes is the effect of the vesicular bronchial inflammation.

The time within which either of these terminations takes place varies in different cases. If, under the use of blood-letting, all the symptoms of laboured breathing, cough, and of fever subside, then resolution may be anticipated in the course, or

within the limits of the first seven days. It is known, however, that termination by resolution may take place at later periods, for instance, the eleventh, fourteenth, and twentieth days, and as these correspond with the critical days of the ancients, the circumstance has been supposed to give confirmation to that doctrine. It may be doubted whether, after the seventh day, it is, strictly speaking, a termination by resolution, since generally after that time some effusive extravasation must have taken place, and part of the lung may have become hepatized or consolidated.

Whenever the symptoms continue longer than fifteen days, and are accompanied with absence of respiratory murmur and dulness on percussion, it must be inferred either that hepatization has taken place, or pleuritic exudation, or both conjoined.

When the disease is in the second stage only, or that of obstruction, and the symptoms show that it is subsiding, the crepitous rattle, which had been observed to be distinct, gradually subsides, and the murmur or rustling sound, indicating that the air is penetrating the small bronchial tubes and vessels, begins to be heard.

When the distemper has attained the third stage, or that in which more or less of the lung is consolidated, and the change is indicated by the absence of respiratory murmur with dulness on percussion, the first indication of the approach of resolution is the return of the crepitous rattle, heard first at the margins of the part, and then in the centre; and eventually this subsides more or less completely, and respiration becomes audible. In many cases, however, in which the dulness has taken place, especially if it be in the lower part of the lung, it continues for the whole of life.

When pneumonia with symptoms neither very violent nor very slight continues for many days, hepatization of the lung, purulent infiltration or suppuration is to be feared. This, however, is not to be determined precisely by the number of days; for not only after the fourth, but even after the tenth or twelfth day, there have been examples of pneumonia ending in resolution; and, if the disease has undergone some intermission and again recurred, resolution may take place at a much later period. Cullen concluded, that if a moderate disease in spite of proper remedies, be protracted to the fourteenth day without considerable remission, suppuration may with some certainty be expected; more so if no signs of resolution have ap-

peared, or if an expectoration already commenced had ceased, with increased difficulty of breathing and slight abatement of the other symptoms. He also inferred that effusion terminating in suppuration has taken place, when the breathing is more difficult in the horizontal posture, and when the patient lies more easily on the affected side. These opinions appear to be the natural result of confounding pneumonic inflammation with pleurisy, to which they in some degree apply. Suppuration of the pulmonic tissue, as described by Laennec, certainly may take place after several days, especially in the acute form of the disease; but it generally produces death very rapidly. If it do not, the usual symptoms of shivering or chills in various parts of the body, with continuing quickness of pulse, cough, difficult breathing, and afterwards profuse but partial sweats with the other symptoms of hectic will take place. The respiratory murmur is not heard when the stethoscope is used.

Not an unfrequent termination is the chronic form of the disease for which physicians have too often mistaken suppuration. That an acute attack of peripneumony is verging to the chronic, may be inferred when the disease, either with or without remedies, is somewhat relieved, but shows no tendency to disappear entirely. The cough, difficult breathing, and acute pain abate or cease; but the patient does not seem relieved. His skin is hot and dry, his pulse quick, and sharp; he complains of a sense of weight in the chest; his breathing is occasionally difficult in the horizontal posture, especially during the night; and he gradually slips into hectic fever with all the signs of pulmonary consumption. In this case the stethoscope indicates a greater or less portion of one or both lungs, completely without respiratory murmur; and in general the affected side emits a dull sound on percussion, either from fluid within the pleura or consolidation of the lung, or both conjoined.

The termination of pneumonia in gangrene is stated by Cullen to be much rarer than is imagined. According to the researches of Laennec and Schroeder, it can hardly be regarded as a termination or result of inflammation, but rather as a disease essentially and originally gangrenous. It shall therefore be noticed under another head.

VARIETIES.—Pneumonia has been distinguished by practical authors and nosologists into several varieties, according to certain modifying circumstances. The following list comprehends the most important, 1. Hemorrhagic Peripneumony; 2. The spurious

or bastard Peripneumony (*Peripneumonia Notha*); 3. The chronic, slow, or latent (*Pneumonia chronica*); 4. The gastric or bilious (*Pneumonia gastrica vel Pneumonia biliosa*); 5. The nervous or Typhoid Pneumonia (*Pneumonia Nervosa et Typhodes*), and 6. the malignant, pestilential, or gangrenous (*Pneumonia septica vel Pneumonia maligna*) *gangraena pulmonum*.

a. Hæmorrhagic peripneumony (*Pneumonia Hæmorrhagica*.) Cullen observed, that pneumonia had a termination peculiar to itself, namely, the effusion of a quantity of blood into the cellular texture, (*i. e.* the filamentous or parenchymatous tissue) of the lungs, which, soon interrupting the circulation of the blood through these organs, produces fatal suffocation. In some instances, however, this extravasation of blood does not produce immediate suffocation. These appear to be principally when the effusion takes place in limited and isolated points, for instance, forming small amorphous masses about the size of a filbert or walnut in the lower lobes of one or both lungs. The portions of lung thus the seat of bloody extravasation become firm, resisting, uncrepitating, dark-coloured and granular in structure. The boundaries are generally distinctly circumscribed, and the difference between them and the surrounding portion of lung is distinctly marked. When near the surface of the lung they are both felt and seen through the *pleura* by the deeper brown colour over them, by their firmness and solidity, by not collapsing while the rest of the lung collapses, and by breaking down instead of collapsing when they are compressed. In these dark-brown, hard, granular masses, the blood-vessels and the bronchial tubes and vesicles are completely obliterated, and their canals closed, and the membrane of the contiguous bronchial tubes is dark brown, thick, and friable.

The change, indicated by the presence of these masses in the lung, which had originally been described by Baillie under the name of the brown tubercle of the lungs, was afterwards made the subject of particular attention by Laennec, under the denomination of pulmonary apoplexy. The term is neither happy nor very significant. And Laennec has been led, in his attachment to physical changes in the structure of organs, to convert into a disease, that which in correct pathology is the effect of morbid action; and he has farther been led to represent this lesion as the pathological cause of hæmoptysis. Had he said that hæmoptysis or hemorrhage from the lungs, and this dark brown circumscribed induration of the lung were ef-

fects of the same cause, the representation would have been more just. Both these phenomena are the effects of the previous congestion and injection of the lungs which terminates in this extravasation, and, providing the extravasated fluid get into the bronchial tubes, it may be coughed up in the form of blood more or less pure. In general, even, when blood is coughed up in this manner, a quantity, more or less considerable, is at the same time effused into the interstices of the pulmonic filamentous tissue, where it stagnates, and at length coagulating gives rise to the granular dark-coloured solid indurated masses found on dissection disseminated through the lung. These masses are not the cause, but the effect of the hemorrhage, which is itself the effect of previous congestion.

The change now mentioned is often found in the lungs as an effect of disease of the heart, especially degeneration, ossification, and arctation of the mitral valve. But I have observed it take place independent of this; and I have met with a remarkable instance of it in the lungs of an infant of twelve or thirteen months.

These and other circumstances lead me to regard this change as one of the effects of pneumonic inflammation, and I would therefore refer it to the present head under the name of hemorrhagic peripneumony, (*pneumonia hæmorrhagica*.)

b. Of the other varieties, the second is rather a species of vesicular bronchitis, and as such has been already described under its proper head.—(Vol. i. p. 837.)

c. a. The third, viz. the chronic or latent peripneumony, occurs under two forms. In the first it presents the same anatomical characters as the acute disease, but comes on in a more insidious and gradual manner. Andral, indeed, represents the anatomical character of chronic pneumonia to be hardening of the pulmonic tissue, with a yellow, gray, black, or brown tint, with impermeability to air. This, however, it must be remembered, is the ultimate result of a series of changes, in which the portion of lung has been previously the seat of red coloration and congestion, infiltration of blood, and at length infiltration of blood and lymph. In this mode it most frequently steals on imperceptibly, with cough aggravated in the winter season and on exposure to cold, slight dyspnœa which increases gradually, very slight febrile symptoms aggravated during the night, gradual wasting and eventually death, either by bastard peripneumony, a

sudden and unexpected attack of the acute disorder, or the establishment of pleuritic inflammation.

In less frequent cases the same change is sometimes left as a residue of the acute form of the disorder.

c. c. In the second form of chronic pneumonia the inflammatory disorder comes on in a different manner. Either at the same time, or successively, inflammatory congestion, indicated by redness, induration, and at length the effusion of blood and lymph, takes place in several, sometimes many points, of one or both lungs. This goes on for weeks or months, until the whole of both lungs present a multitude of roundish or irregular firm nodules about the size of small nuts, diffused through their substance. When these are divided by the knife they present an exterior of reddish, firm vascular substance, inclosing in general small grains of grayish-coloured matter, sometimes like coagulated lymph, sometimes like purulent matter. They are manifestly confined to the minute divisions or lobules of the lungs; and as the inflammatory action has thus originated in, and been chiefly confined to these lobules, the disorder has not improperly been denominated *lobular pneumonia*, (*pneumonia lobulorum*.) The lungs at the same time are infiltrated with serum; the bronchial tubes contain puriform mucus; the *pleura* is invariably more or less inflamed and covered with patches of albuminous exudation, especially opposite to those inflamed lobules which approach nearest to the *pleura pulmonalis*; the pulmonic and costal *pleuræ* are often united by soft recent adhesions; the upper part of the apex of the lung generally adheres extensively; and sero-albuminous or puriform fluid is found in the cavity of the *pleura*.

The symptoms of this disorder are imperfectly known. In the few cases which have fallen closely under my observation, the existence of disease of the lungs was not even suspected; and in the last case which I had occasion to inspect, the patient, a boy of fifteen, was supposed to have died of continued fever. Febrile symptoms, indeed, he presented for about eight or nine days previous to the fatal event, and at the same time the breathing was rapid, he complained of headach, and afterwards a little delirium and coma ensued. I learned from his relatives that he had habitual difficult breathing, but I could not ascertain that he had cough or expectoration.

Besides the morbid state of the lungs in this form of disorder,

it is usual to find inflammatory redness and enlargement of the muciparous follicles of the colon, the cæcum, and sometimes of the ileum, and these may be affected with ulceration.

The *meninges* also are generally injected, and fluid is formed in the subarachnoid tissue, within the ventricles, and within the spinal theca.

This form of pneumonic inflammation is most usually found in children and young persons. Its causes are imperfectly known. But, from the circumstance of its being often associated with the disorders of the joints, bones, and similar tissues usually imputed to the influence of the strumous diathesis, its development may be inferred to be dependent on the presence of this diathesis, and created by exposure to cold or some similar exciting causes. From the peculiar form which it assumes, and from its association with ulceration of the intestinal follicles, as well as the circumstances in diathesis already mentioned, I regard it as the early stage of tubercular consumption. The only reason that it is not so frequently met with as the other ordinary forms of pneumonia, is, that it seldom proves fatal in the early stage, or before it has not only occupied the whole of both lungs with the morbid deposit, but produced more or less excavation.

Marks of chronic diffused pneumonia are always found, I must farther observe, in every case of tubercular infiltration and destruction of the lung.

d. The gastric or bilious *pneumonia* has been rendered a subject of great importance by Lepecq de la Cloture, * Stoll, † Romain, ‡ Ackermann, § Jansen, || Guidetti, ¶ Borsieri, Goeden, Hauff, and various other foreign physicians. Its existence as a form of peripneumony is almost denied by Andral, and I confess that in this country it is seen so rarely, as to justly give rise to doubts of its individual and independent reality. Pneumonia doubtless takes place in persons in whom the alimentary functions are disordered, and sometimes the hepatic

* Lepecq de la Cloture *Observat. sur les Maladies Epidemiques*. Paris, 1776.

† *Ratio Medendi*, Vol. iii. and iv. v. Part ii. v. vii. p. 112, 117, 346.

‡ Romain, *Essai sur la Maniere de Traiter les Peripneumonies Bilieuses*, Metz. 1779.

§ Ackermann, *Pleuritidis Biliosæ brevis adumbratio*, Kilon, 1785.

|| *Dissert. de Peripneumonia Biliosa*, Goett. 1787.

¶ Guidetti, *Dissert. de Pleuritide Biliosa*. Heidelberg, 1790.

Vide books mentioned at the beginning of the section.

secretions perverted or deranged; and it sometimes happens even that symptoms of gastric and hepatic disorder simulate symptoms of pneumonic inflammation. The first must be regarded as a mere complication, such as is very frequently met with in practice. The second must be viewed as a distemper totally different, and requiring different treatment.

The class of persons in whom pneumonia and bronchitis is observed to assume the bilious or gastric disorder in this country most frequently are the intemperate, especially spirit and wine-bibbers, the gouty, and those labouring under mental anxiety and distress.

e. The term nervous or typhoid *pneumonia* has been applied to pneumonia taking place, as it often does, along with typhoid fever, or giving rise to symptoms of typhoid fever. Of this variety two forms may be specified.

1st, Either a person attacked with continued fever presents in the course of it symptoms of bronchial inflammation or even pneumonia, not very well marked, but still sufficiently so to be recognized by the skilful observer. Sometimes, not always, there is cough; for in certain cases the patient is so feeble that he is unable to cough or expectorate. In general the respiration is laborious, limited, and irregular; the face, cheeks, and lips are livid; the hands and feet livid and cold; and the pulse small, soft, and sometimes irregular or intermitting. Upon employing auscultation the presence of pneumonia in the posterior and inferior region of one or both lungs is recognized. In this form of the disorder it is said to be typhoid fever with pneumonia.

2d, In a person attacked with pneumonic inflammation, the symptomatic fever does not assume the open and distinct symptoms usually presented, but observes a slow, latent, and insidious form, in which the symptoms of great feebleness, (*adynamia*), and nervous irritation, (*neurasthenia*), are predominant. Of these the most prominent are great oppression at the breast, intolerable anxiety, and jactitation; a sense of internal heat; great difficulty in breathing and coughing; total cessation of pain if previously felt; a deceitful calm or listlessness, delirium in the night especially, or *typhomania*; dryness and tremulousness of the tongue, unquenchable thirst, meteorismus of the belly, dry burning skin; faintings, subsultus tendinum, feeble-

ness of the voice or aphonia, extreme debility of the voluntary motions, great softness and weakness of the pulse, which is also sometimes quick, sometimes natural. In some cases vomiting or hiccup, or both ensue. The surface of the skin presents dark-coloured petechial spots or a miliary eruption, especially on the anterior part of the trunk. Hemorrhages from the nostrils, throat, lungs, stomach, and intestinal tube are liable to take place; the urine is sometimes dark-coloured and bloody; and discharges of blood from the *uterus* in females are not unusual. The blood, if drawn from a vein, presents in general a loose, soft coagulum, with a small proportion of serum. In a few rare cases the clot is firm.

As the symptoms proceed the delirium or typhomania passes into lethargic sopor; the breathing becomes stertorous, and is attended with general tracheo-bronchial rattling; the pulse becomes small, and can scarcely be felt; convulsions occasionally ensue; the head, neck, and chest, are covered with cold fetid sweats; the extremities become cold, and death follows.

Morbid anatomy shows that this distemper is of the kind denominated pleuropneumony with vesicular bronchitis. The lungs are found gorged with blood, dark-coloured and dense towards the posterior part, not indurated or consolidated, but rather œdematous and doughy. The surface of the lung presents dark livid patches. The pleuræ contain sero-sanguine or sero-purulent fluid, with shreds of lymph. Sometimes even the pericardium and the peritoneum present fluids of the same kind, with flocks of lymph. The chambers of the heart also and the large vessels contain large, loose, soft coagula of blood. In some epidemics the intestinal tube contains *lumbrici*.

A state of the lungs very similar to this is observed to take place in persons labouring under sea-scurvy, (*vide* Huxham, Chapter ii. p. 186, and Henderson, Edinburgh Medical and Surgical Journal, Vol. lii. p. 10.)

f. Pneumonia Septica. Gangræna Pulmonum. It may be doubted whether pneumonia ever legitimately terminates in mortification or gangrene of the lung; and there is strong reason to think, that, when mortification does take place in these organs, it is the result not of ordinary inflammation, but of a peculiar kind of inflammation, the tendency of which is to gangrene.

Gangrene of the lungs takes place either as a part and con-

comitant of continued fever with typhoid symptoms and pestilential fevers in general, or it may occur, so far as it is possible to judge, as a primary species of inflammatory disorder of the lungs.

α. In the first case, a person with the usual symptoms of aggravated and rather intense typhoid fever, and commonly with marks of imperfect general circulation and perverted and imperfect pulmonary circulation, as lividity of the face, nose, cheeks, lips, and extremities, coldness of the extremities, hiccup, and small pulse, presents obscure symptoms of disorder of the lungs, laborious and irregular respiration, sometimes hurried, sometimes slower than natural, slight cough, at first dry, afterwards moist with sputa, very viscid, glutinous, orange-coloured, streaked with blood, and very fetid offensive breath. The sound upon percussion is more or less dull; and upon auscultation either the crepitant rattle, sometimes with large bells, is heard, or this is heard with inaudibility of the vesicular sound most usually in the subscapular and inferior convex region of one or both lungs. With these symptoms are usually associated great feebleness, delirium or typhomania, intermittent, irregular small pulse, a tendency to gangrene of the extremities and sacrum, hiccup, subsultus tendinum, diarrhoea, and at length with increasing difficulty of breathing, fetor of the breath, and tracheo-bronchial rattling, death ensues. Sometimes hemorrhage takes place from the lungs, and contributes, with the other marks of feebleness, to accelerate the approach of the fatal event.

β. In the second case, the distemper appears to come on at first in general as an affection of the lungs. Either the patient has an attack of pneumonic inflammation, or bronchial disease, or spitting of blood, (*hæmoptysis*), with more or less dull pain in some part of the side or chest, most commonly in the mammary or submammary region before, and the subscapular region behind, and sometimes as if passing between these two points. Cough continues and increases, with *sputa* in general reddish, brown, or bloody, and sometimes with pure blood, and very offensive fetid breath. The countenance is anxious and livid; the complexion dingy, wan, and leaden-coloured; the cheeks occasionally tinged with a reddish or pink-coloured flush; the eye heavy and pale, sometimes wild, glaring, and slightly suffused, in other instances hollow and ghastly. In the other

symptoms considerable variety takes place. Thus in one case, no complaint or symptoms appear which indicate a serious disorder of the lungs. The patient is merely feeble, with dingy wan complexion, irregular breathing, cough, and a little expectoration. In other cases, pains, more or less acute, are felt in the chest, and the labour of respiration, with debility, is considerable.

The most characteristic symptom of the distemper, the foetid offensive breath, is not an early symptom. It does not take place till the disease has subsisted for some time, two weeks, or even a longer period; and indeed it appears only to take place after a communication between the seat of disorder and the bronchial tubes and the air inspired and expired has been established. When it takes place it is impossible to entertain any doubt of the presence of the distemper; but gangrene of the lungs may, on the other hand, exist, and have proceeded to a considerable extent, yet without giving rise to fetor of the breath and expectoration.

As the disease advances, expectoration becomes more abundant, with sputa reddish, brown, blood-coloured, or consisting of blood more or less pure, and the characteristic fetid odour. Respiration becomes very irregular and laborious, being at one time slow, at another quick and panting. In general, immediately before the fetid odour of the breath and sputa is manifest, more or less stupor and much anxiety come on, with small, feeble, irregular pulse.

In general, after the foetor of the breath and sputa is established, the distemper tends rapidly to the fatal termination. In one case which fell under my own observation, the distemper continued thirty days before the fetid odour of the breath was evinced. The breath and *sputa* were foetid on the thirtieth day of the disorder, and death took place the second day afterwards. In one of the cases by M. Schröder, death took place nine days after the first occurrence of foetor. In another case attended by myself, the offensive foetor of the breath and *sputa* was recognized on the 23d of February, and death took place on the 6th of March, eleven days after. This, I believe, may be regarded, as nearly as may be, the latest period that life is likely to be prolonged, after the occurrence of well-marked foetor of the breath and *sputa*.

The duration of this disease varies from four weeks to two

months. It is rare that physicians witness its commencement; for it is only when the patient can no longer move about, or pursue his ordinary occupations, that he applies for assistance; and in general the disease has been proceeding for eight days or two weeks when he is first seen.

The appearances found after death are of two kinds. One is indicative of what is named diffuse gangrene of the lungs, the other is circumscribed. In the first case, a mass of lung, about two inches and a half or three inches wide, but irregular in figure and outline, is converted into a soft, pulpy, dark ash-coloured substance, which, when it is handled or pressed by the finger, falls down into a loose moist mass—emitting a fetid offensive odour, without trace of the usual structure of the lungs, except a few bronchial tubes, and blood-vessels and filaments and shreds of filamentous tissue. This mass is in general bounded by, but it does not terminate abruptly in, healthy lung. It is soft, dingy, and infiltrated with a dark, ash-coloured, dirty serous liquor. Occasionally the surrounding portion of lung is hepatized or infiltrated with blood, or blood-coloured serum; the bronchial tubes always contain much blood-coloured viscid mucus; and sometimes the *pleura* is reddened, covered with lymph or adhesions, and contains fluid in its cavity.

The part of the lung most usually thus mortified is either in the lower lobe, the upper part of the lower and lower part of the middle or upper lobe on the left side, or the middle lobe alone on the right side; that is, the central part of the lungs, but verging toward the lower part.

In the second form, or that which is circumscribed, a portion of the lung, generally towards the surface, presents a dark-coloured hard patch, varying in size from a shilling to a half-crown piece or more, often pretty exactly circular, bounded all round by healthy lung, and not unusually a distinct reddened circle of vessels, or vessels with lymph. This circular hard patch, which resembles closely an eschar produced by caustic potass, or any of the cauteries, may either adhere or be detached. In the latter case, it generally leaves disclosed a cup-like cavity, a little larger than the detached eschar, not loose or filamentous, or shreddy-like as in diffuse gangrene, but firm, granular, with the blood-vessels and bronchial tubes closed, and with the surrounding lung more softened, but generally presenting marks of pleurisy, *pneumonia*, and *bronchitis*, all united.

Sometimes albuminous exudation over the *pleura* and within its cavity is found to have taken place,—a circumstance which is to be ascribed to secondary pleurisy caused by the inflammation induced to detach the dead eschar.

Though these forms of gangrene of the lung are sometimes distinct, they occasionally take place at the same time in the same lung. Thus in the case of one of the patients who was treated by myself, a man of fifty-six, diffuse gangrene was observed towards the internal and anterior surface of the left lung, and circumscribed gangrene in the form of a cup-like cavity at the outer surface of the same lung.

Laennec represents this disease as occasionally terminating favourably. Of this I have never seen an instance, either in my own practice, or in that of any of my colleagues at the Royal Infirmary. It is, indeed, a disease almost necessarily fatal, whether from the kinds of constitution in which it occurs, or its deleterious effects on the lungs and their functions.

The causes of gangrene of the lungs are little known. The disease occurs either along with typhoid fever, or gives rise to typhoid symptoms. It is more common in persons beyond the ages of forty-five or fifty, and especially in those who have lived intemperately. It also occurs in persons much younger, or between twenty and thirty-six. But very often in persons at this age it is found to have taken place either during a mercurial course, or shortly after its completion.

Has this distemper any tendency to induce inflammatory or suppurative disorders in remote organs, for instance, the brain? In one case which fell under my observation, the patient was attacked with inflammation of the brain, which proceeded to supuration, and proved fatal.

In certain circumstances, this disease appears to prevail epidemically, whether it be the effect of a typhoid or pestilential fever which gives rise to it, or it depends on the prevalence of some peculiar telluric or atmospheric miasma. In the year 1348, a febrile disorder, with intense pneumonic symptoms often terminating fatally by profuse or continued hemorrhage from the lungs, appeared in Italy, and spread between that year and 1350 over many parts of Europe, destroying much of the population of different countries in an incredibly short space of time. This disorder, which was emphatically denominated by the populace the Black Death, appears to have possessed the charac-

ter of fever with gangrenous pneumonia. In many pestilential epidemics, however, as in that of Marseilles, Transylvania, and other countries, carbuncular and glandular plague appears to have been attended with symptoms of pulmonary mortification.

Pneumonic inflammation, very often with vesicular *bronchitis*, occurs secondarily in ague, remittent fever, typhoid fever, small-pox, measles, pulmonary consumption, rheumatism, and rheumatic gout, and disease of the kidney. I have also observed the disease take place in a latent or insidious manner in the insane, from chronic meningeal inflammation.

PROGNOSIS.—This has been partly already anticipated in specifying the varieties of the disorder. Pneumonia, though always a dangerous disorder, yet, if taken early, and opposed by suitable active treatment, may be made to terminate favourably. The circumstances which indicate the favourable termination are, the breathing becoming less frequent and laborious after blood-letting, the inspiration being more full and deep and less checked, the cough becoming less urgent, the pulse abating in frequency, and becoming soft, regular, and full, and all feelings of uneasiness vanishing in general with a moderate and gradually diminishing expectoration. Though the subsidence of the disease or resolution with expectoration is good, resolution without, or with very little expectoration, is better, since there is less chance that the lungs can be much injured or the bronchial tubes and vesicles can be obstructed, or chronic bronchial disorder established. General sweating, diarrhœa, or hypostatic urine are not uncommon effects of the favourable issue. On the contrary, an unfavourable termination may be dreaded, when, after several copious blood-lettings, the respiration continues quick, laborious, and panting, as if it became abdominal, if cough be frequent and urgent, if there be not only *dyspnœa* but *orthopnœa*, or incapability of breathing unless in the elevated position, if the cheeks, lips, and nose, be livid or livescent, if the head and neck be moistened with partial sweats, and if the pulse continue quick, small, and sharp. Though moderate expectoration, associated with alleviation in the *dyspnœa*, cough, and other symptoms be favourable, yet much expectoration, especially if the *sputa* be deeply tinged with blood, or consist of pure blood, is less favourable, and indicates the presence of an uncontrolled or imperfectly controlled inflammation. Sudden cessation of expectoration if attended with increased urgency of coughing and

dyspnœa is also bad ; but the gradual cessation is a favourable symptom. Rapid laborious breathing, with *orthopnœa*, central contraction at the epigastric region, incapacity to cough, lividity, swelling and coldness of the extremities, restlessness and jactitation, are all unfavourable symptoms, and their increase denotes the approach of the fatal termination. Delirium, typhomania, or stupor, are always very bad symptoms, and too often mortal.

With regard to classes of persons attacked with pneumonic inflammation, the disease is more formidable in infants and children, and in the aged, than in young or middle-aged robust adults. In pregnant or puerperal females also, it is more formidable than in females not in these conditions. In drunkards, and those addicted to the habitual or excessive use of spirituous liquors, it is always a dangerous distemper, for two reasons, *first*, because it is attended with much general vesicular *bronchitis* ; and *secondly*, because it is liable to give rise to spectral *delirium*, or the symptoms of methystic brain fever, and destroy the patient rapidly.

Lastly, pneumonic inflammation affecting the whole of one lung is more perilous than when it affects part ; and double *pneumonia*, or that seated in both lungs, is always more dangerous than the single disease.

As to complications, pneumonia occurring in those with disease of the heart, or persons labouring under or just recovered from small-pox or measles, and in those of gouty diathesis, is always a formidable disorder, and liable to terminate fatally. Pneumonia also taking place after burns, either of the trunk or extremities, and after amputation or any other capital operation, is almost constantly an unmanageable and fatal disorder.

ETIOLOGY.—The causes of pneumonic inflammation are in general all those which induce inflammation in general. All observation concurs in showing that though it may occur at any period of the year, it is chiefly a disease of the cold seasons, and especially the cold seasons in temperate countries. It prevails chiefly after the winter solstice, and between that period and the approach of the summer solstice, the great majority of cases being observed to take place in Great Britain and France between the close of December and the end of April, or even the end of June. Exposure to cold currents of air while overheated is a common cause ; and premature exposure to air or to apartments imperfectly ventilated after slight illness is very

liable to be followed by an attack. Influenza in this manner was very often followed by pneumonic inflammation in the last epidemic with which this country was visited in 1836 and 1837.

Some accessory causes are sometimes observed to induce peripneumony. Thus the presence of tubercles in the lungs has been generally regarded as a predisposing cause. But it may always become a question, what induces the formation of tubercles, and this must be referred in the generality of cases to strumous or morbid diathesis, and the exciting influence of cold.

TREATMENT.—The treatment of pneumonic inflammation is to be conducted on the general principles of controlling inflammatory action, and preventing its effects on the structure of the lung.

The first, most indispensable, and the most effectual remedy for accomplishing this object, is blood-letting from the arm, carried to such an amount both in extent, and by repetition, as may exercise a decided effect on the symptoms of the disorder. Upon the necessity, the advantage, and the efficacy of this evacuation all physicians are agreed. The only point to be determined is, that the diagnosis be established, both as to the presence and the stage of the disorder, and that the evacuation be made early, before any or much effusion into the substance of the lung, causing red or gray hepatization, have taken place. If, therefore, the practitioner be satisfied, by the general symptoms and the physical signs, that he has a case of pneumonic inflammation to treat, the first and most prominent indication is to subdue this; and with this view to detract from twenty or twenty-five ounces of blood to thirty, from the arm at once. It is, perhaps, not in all cases practicable to specify the exact amount to be drawn at first; but I mention this quantity as the average amount which I have found it requisite to draw at first from young or middle aged adults of average strength, in the congestive or injecting stage of the disorder. It is generally believed that females require less to be drawn than males for the removal of the symptoms of this disorder. I have generally drawn not less than twenty-five ounces, sometimes twenty-eight or thirty, from females, between twenty and thirty-eight, when labouring under the symptoms of this distemper.

The principal modifications in the amount of blood-letting arise from the age of patients, and the circumstance of their labouring under any morbid state which contraindicates blood-

letting. Thus in young persons below puberty, it is unnecessary to draw blood so largely as in adults, yet, even in these I have found it necessary to bleed to the extent of twelve or sixteen ounces, when the age was about ten, twelve, or thirteen. In the aged it is seldom desirable to bleed to so great an amount, both because the evacuation may not be so well borne, and because the disorder sometimes assumes the form of bastard peripneumony. And in persons who may be presumed from their habits to be liable to *delirium tremens*, it is unsafe to carry blood-letting to the same amount as in young, robust, and otherwise healthy individuals. In the gouty also and the rheumatic, it has been supposed that venesection for the cure of this disease, is not well borne. But I believe that this objection is not so well founded as the others. It may be said that, if an arthritic or rheumatic patient cannot endure blood-letting for the removal of an attack of *pneumonia*, he will not be benefited by any other remedy, and must, in all probability, die of his disease.

It rarely happens that a single blood-letting, however copious, is sufficient to remove entirely an attack of pneumonic inflammation; and a second, third, fourth, or fifth blood-letting may be requisite before the symptoms undergo decided alleviation. In these circumstances, the safest plan for the medical attendant to adopt, is to see his patient about five or six hours, sometimes sooner, for instance, four hours after the first blood-letting; and, before the physiological effects of the first are altogether over, to have recourse to a second to the extent of eighteen, twenty, or thirty ounces, if requisite. It often happens that the second blood-letting is borne better than the first, and exercises a more beneficial effect, relieving or removing altogether the sense of weight and oppression within the chest, rendering inspiration without pain or coughing practicable, making the respiration slow and full, and relieving the urgency of the cough.

The same rule applies to subsequent blood-lettings, in attempting the complete removal of the disorder.

Blood-letting is in general most powerfully therapeutic in pneumonic inflammation, when it is carried to faintness either approaching or actually induced, (*deliquium animi*;) and hence some physicians have proposed to draw blood in the erect or sitting position, in which this state is more early induced, and with a smaller quantity of blood drawn. Unfortunately the mere

physiological effects thus induced are not followed by corresponding therapeutic effects. The faintness thus induced is quite temporary, and does not operate either on the capillary circulation of the lungs or on the heart. The moment the patient lies down in bed, or at least soon after, all the symptoms of difficult hurried breathing, pain and weight in the chest, and cough, with tense, quick pulse, recur; and little impression appears to be made on the disorder. In general it is better to draw blood in the horizontal or at least the half-horizontal position, until the face and lips become pale, the pulse becomes small and less frequent, and the sensations of approaching faintness be manifest. After blood-letting thus performed and carried to this extent, all the symptoms undergo great and obvious relief.

The amount requiring to be drawn altogether in order to cure thoroughly an attack of pneumonic inflammation, varies according to the stage of the disorder, the amount drawn at first, and the effects caused on the symptoms, the form of the disorder, and the age and state of the patient. In general in robust vigorous male adults, eighty ounces of blood will require to be drawn before the disease is entirely extinct; and if the symptoms of crepitous rattle or induration be present, upwards of 100 ounces may require to be drawn before the symptoms are decidedly abated; and even then part of the diseased lung may be consolidated and remain so for life.

It should never be forgotten that large and repeated blood-letting induces much less debility than the disease being allowed to proceed and destroy the texture of the lung or lungs, and interrupt the process of pulmonary circulation and respiration.

It is important to fix the period at which blood-letting can be best performed, and it has been believed that, if neglected beyond a certain time, it is injurious rather than beneficial. In general it is most efficacious during the first three or four days of the disorder; but it may be performed even within seven days from the commencement; and I have often drawn blood at periods later than this, and when the expectoration consisted of opaque orange-coloured or blood-tinged *sputa*. It sometimes happens even that the symptoms seem, under the use of blood-letting and other measures, to undergo a marked amelioration; and then the patient, too easily delivered from his disorder, exposes himself rashly or prematurely, and has, while the lungs are still morbidly susceptible, a fresh and more severe attack. In

this case blood-letting must still be performed, though it be the seventh, the fourteenth, the twentieth day, or even later.

A dread is entertained by some of suppressing expectoration by blood-letting. It is always desirable to moderate this excretion; and in many instances the disease may be safely treated without allowing much expectoration to take place. The expectoration is always a sort of effort of the bronchial vesicular membrane to relieve the substance of the lungs of the blood and sero-sanguine fluid, with which their vessels or their tissues are surcharged. But it is a morbid effort, and an effort which may be attended with damage both to the lungs and to the *bronchi*; and it is a much safer and more rational method to withdraw the materials of this morbid secretion than to allow it to proceed, with the chance of doing irreparable injury to the substance of the lungs. This is particularly applicable whenever the expectoration is very glutinous, or tinged with blood, or contains pure blood, all of which are morbid effects, and as such should be opposed by prompt and copious venesection. Venesection does not check, but often facilitates expectoration; and may be always used to moderate it, when breathing is difficult and cough urgent.

In certain cases of pneumonic inflammation, in which pain and weight continue in some part of the chest with inaudible respiration and dulness on percussion,—though depletion be indicated, yet, from the slowness of the pulse, and the amelioration of the other symptoms, the propriety of general blood-letting becomes doubtful. The proper remedy, then, is local blood-letting by means of cupping, or the application of leeches to the chest. In general the part demanding this depletion most is the convex and posterior-inferior region of the chest, near the lower angle of the scapula. From ten to twelve ounces of blood may be drawn by cupping, and repeated in the course of a day or two if the symptoms be not mitigated.

The use of derivatives or revellents, by means of blisters, is also indicated. But these remedies are of no use until the violence of the disease has been subdued by blood-letting; and then they appear to be of little avail.

In short, the treatment of this disorder must be confided principally to blood-letting, general and local.

Antimony in nauseating and contrastimulant doses.—In certain forms of the disorder, as the typhoid and bilious, and in the young and aged, in whom it is unsafe to use bloodlet-

ting to a great extent, tartarized antimony presents a powerful remedy for pneumonic inflammation. It is given with this view in two modes. Either it may be exhibited in minute doses of one-fourth or one-eighth of a grain in water until it induces nausea, diaphoresis, diarrhœa, or expectoration; or four or five grains may be given at once, dissolved in one or two ounces of water, and repeated in the course of two or three hours, according to its effects, physiological and therapeutic.

Though the employment of antimonial medicines in the treatment of pulmonary disorders, be a practice which has been long followed by various physicians, and the remedy has been much recommended in small doses, especially by the French physicians, as a diaphoretic and an expectorant in the treatment of pneumonic and bronchial disorders, it was much more completely and systematically brought under the notice of the profession as a remedy in pneumonic inflammation by the practice of Rasori at the siege of Genoa in the years 1799 and 1800. Though it was not a pulmonary disorder, but a petechial fever, which this physician, after many unsuccessful trials with tonics and stimulants, found that he could manage most successfully by means of tartar emetic or kermes mineral, yet he found that the same agent was not less successful in mitigating the severity, and subduing the symptoms of pneumonic and bronchial inflammation. Rasori informs us, that he prescribed four, six, eight, or nine grains of emetic tartar in the course of the day, in as much water as the patient chose, and of which he continued to drink all day long. These large doses were followed only by vomiting once, not very constantly, and sometimes no sensible evacuation whatever, not even intestinal discharges; yet great amelioration in the febrile symptoms, and in general speedy recovery ensued. In some instances of this fever, he administered four grains the first day of treatment, six the second, and sixteen the third, without any other effect except vomiting, and sometimes not even that, yet with speedy disappearance of the worst symptoms of the disorder and eventual recovery. He afterwards found, that tartar emetic given in this manner was highly efficacious in removing symptoms of pneumonic inflammation.*

The remedy was afterwards employed by Laennec, though in

* *Storia della Febbre Petecchiale Di Genova Negli anni 1799 et 1800, &c. Di G. Rasori, Proto-medico, Professore di Clinica nelle due Spedale Civili Militari di Milan. Racolta, di Opere Mediche Moderne Italiane, Tomo ix. Bologna, 1820, p. 257.*

a manner a little different. After recognizing the fact of the existence of the distemper, M. Laennec generally prescribed blood to be let from the arm to the extent of from eight to sixteen ounces, and this he rarely repeated, unless in the case of patients labouring under disease of the heart, threatened with symptoms of apoplexy, or some other congestive disorder of an internal organ. Next, that is after by this blood-letting the force of the disease is somewhat diminished, he gave one grain of tartar emetic dissolved in two ounces and a-half of weak infusion of orange-leaf sweetened with half an ounce of syrup; and this was repeated every second hour for some time, after which the patient was left quiet, and allowed, if so disposed, to sleep. In intense cases, in which both lungs are affected, or the oppression is great, or the head oppressed, the medicine was continued in the same dose and at the same intervals, until amendment appeared either in the general or the stethoscopic signs. In some instances Laennec increased the dose of the tartar emetic to one grain and a half, two grains, or even two grains and a half, without increasing the proportion of the vehicle.

The physiological effects of this mode of exhibition are the following. The greater number of patients vomit twice or three times, and have five or six stools the first day; on the following days only slight evacuations take place, and sometimes none at all. Not a few bear the medicine without either vomiting or catharsis. The state of the system, when neither of these evacuations follows the exhibition of emetic tartar, or when, after having once or twice taken place, they cease to recur, has been denominated *endurance* or *tolerance* (*la tolleranza*), and it is believed to be more or less essential to the establishment of the therapeutic effects of the mineral. In general, whenever the patient endures the tartar emetic without vomiting or purging, he has a better chance of recovering from his disorder under its operation, than if these evacuations take place. In order to obtain endurance and counteract vomiting and catharsis, Laennec combined tartar emetic with the syrup of poppies. For the same purpose the English physicians generally employ opium, laudanum, or the solution of muriate of morphia.

Many English physicians, satisfied with producing the effect, and not solicitous about the method, dissolve four or six or ten grains of tartar emetic in an equal number, or half the number of ounces of water, and administer from one drachm to half an

ounce of this solution, (equivalent to one-eighth, one-fourth, or one-half of a grain), every hour or second hour, until slight squeamishness is induced. If vomiting take place, between ten and fifteen minims of sedative liquor or solution of muriate of morphia is added to each dose; and this is continued until the vomiting ceases, and the symptoms appear to be alleviated. Regarding the use of opiates I shall speak presently.

Another mode of administering tartar emetic, not very dissimilar to that of Rasori, I have found of great efficacy in certain forms of pneumonia, especially the typhoid, in which I have found it either impossible to carry blood-letting to the extent requisite to subdue the distemper, or to employ this evacuation at all. This consists in giving at once four, five, or six grains of tartarized antimony in one or two ounces of water, and allowing the patient to be without any other medicine or much drink for six or eight hours. The most usual effect of this is either to produce temporary sickness and very slight vomiting, once for instance, or no vomiting at all; yet in the course of a short time the patient becomes quiet, falls asleep, and awakens apparently much relieved in the course of eight or ten hours; after which time, if the symptoms of the disorder be not decidedly abated, the same dose should be repeated. In this case the emetic effect appears to be counteracted, and endurance of the mineral consequently promoted, by the small proportion of the vehicle compared with the large quantity of the salt. Sometimes *diaphoresis* takes place, and in some instances one or two liquid alvine evacuations.

Whatever mode of exhibition be adopted, it is important to bear in mind, that tartarized antimony is much less likely to induce vomiting in large doses, and in small quantities of fluid, than in small doses and large quantities of fluid.

The other branches of the antiphlogistic regimen require the administration of eccoprotics and cathartics to keep the intestinal tube free from irritation, the use of diluents and diuretics to act on the skin and the kidneys, and the keeping the patient in such circumstances that he shall not be overheated nor chilled.

The use of cathartics, though not having much influence in thoracic inflammations, is, nevertheless, indispensable in all cases of pneumonic inflammation. The eccoprotic effect, however, is quite sufficient, and it is unnecessary to produce catharsis. In some instances emollient enemata have a beneficial

influence in removing sources of irritation. In the bilious variety of pneumonia, the regular exhibition of cathartics, so as to procure one or two effectual evacuations daily, is of still greater importance; and in the typhoid variety this practice should never be omitted. The most convenient cathartic is the exhibition of two, or three, or four of the colocynth pills, sometimes with a blue pill, sometimes with six or eight grains of calomel. A good method is to combine eight grains of calomel with fifteen or twenty grains of the compound colocynth mass, and exhibit the mixture in the form of pill. If the immediate cathartic effect be not thus fully produced, an ounce of castor oil, or four ounces of the saline infusion of senna, should be administered next morning.

I have occasionally seen great benefit result from the use of a full dose of oil of turpentine in the typhoid pneumonia and pneumo-bronchitis, where the face was dingy and livid, the respiration oppressed, feeble, and hurried, and the patient unable to cough. This remedy, whether it produces vomiting or purging, or both, is often followed by manifest relief, a clear colour of the complexion, free expectoration, relief of the dyspnoea, and final disappearance of all the bad symptoms.

The use of diluents is indicated throughout the whole course of the disorder, by the thirst, the furred tongue, dry skin, and scanty urine. Lemonade, or any of the ordinary vegetable ptisans, as barley-water, toast-water, acidulated with lemonade or tamarind-water, form the most convenient potions. They are generally recommended to be taken tepid, or at least not cold, as this checks, or is supposed to check, perspiration. In some instances, however, to allow the patient plenty of cold water, is both safe and curative. Tea and coffee, whey, and similar watery liquors, are also admissible.

Baglivi and many other physicians thought it important in diseases of the chest, and especially the lungs, to excite the action of the kidneys. *In morbis pectoris semper ad vias urinae ducendum est.* This practice has been very generally followed; and it is some confirmation of its utility, that many of the reputed remedies for pectoral disorders possess diuretic powers. Thus nitre was long given as a refrigerant diuretic; squill as an expectorant; dandelion (*Leontodon taraxacum*) was also strongly recommended; and foxglove has received a kind of reputation in pectoral ailments and disorders. It should be remembered, however, that none of these remedies deserve any con-

fidence in themselves in the treatment of pneumonic inflammation; and it is only as adjuvants to the great remedy blood-letting, general and local, that they should ever be employed.

Nitre (*Nitras potassæ*) may be given in doses of four or five grains three or four times daily. Digitalis may be given either in tincture or in substance, as I shall presently mention. When in tincture, it is conveniently conjoined with the sweet spirits of nitre, which also being diuretic, aids the effect of the foxglove. The latter, however, should be given only when the disease is decidedly on the decline, and all the inflammatory symptoms have been subdued by means of blood-letting. Taraxacum, which was long in repute, is an insignificant remedy, unless the recent root can be procured, and its decoction given along with nitrate of potass. In this manner I have seen it sometimes excite a considerable discharge of urine; but it is not equally powerful in relieving the symptoms of pulmonary disorder.

An important part of the antiphlogistic regimen is to keep the patient in an apartment cool, but not cold; and if in the cold season a fire be requisite, it should never be allowed to overheat the chamber, which otherwise should be large and well ventilated, but free from draughts or currents of air. The temperature may be about 50° or 55°. Cullen recommended that the patient should be kept, if possible, out of bed, if he can easily bear it. In few severe cases of pneumonic inflammation is the patient inclined to be constantly out of bed, though he often may raise himself to the erect position for the sake of breathing more easily, and relieving the urgency of the cough.

At a time when the distinction between catarrh and bronchial inflammation on the one hand, and pneumonic inflammation on the other, was not understood, and when, consequently, it was imagined that expectoration was necessary to the cure of pneumonic inflammation, it was common to exhibit remedies called expectorants. It may be justly doubted whether the *Materia Medica* really possesses a single remedy entitled to this character; and it is certain that none of the reputed expectorants act in promoting expectoration until the inflammatory action is subdued, when a little expectoration takes place spontaneously. On this account all the stimulant expectorants, as squill, gum-ammoniac, and the balsams, are injurious in the early stage of the disorder, and quite unnecessary in the latter. Carbonate of ammonia seems sometimes very useful in the latter stage of

the nervous or typhoid form of the disorder ; and as such it may be given in doses of five grains three or four times daily.

The only safe remedy, however, as an expectorant, is tartarized antimony, administered in either of the modes already mentioned. In general it is most expedient to give it in minute doses, so as to induce squeamishness, but not vomiting, when it produces at the same time easy expectoration. The use of the large dose, however, is not from this indication precluded. The great advantage of this mineral salt is, that its use is not restricted to any single form of the disorder, but is applicable to all of them ; and after blood-letting, it may be exhibited in any stage.

One method of promoting expectoration, founded on the same erroneous hypothesis, has been to recommend the exhalation of various stimulating agents capable of exciting the tracheo-bronchial membrane. Such are the steams of hot water impregnated with vinegar, the vapour of boiling tar, the steam or vapour of pitch or rosin in hot water, or made to melt and boil, and similar articles. The whole of these substances have been recommended, in the idea that *pneumonia* and *bronchitis* are the same disorder. In the latter, and in catarrh, they are sometimes useful ; in the former they never are. It is only where the two diseases are at the same time present, or in cases of vesicular bronchitis, that such stimulating vapours are useful ; and in this class of cases even they are not always useful.

Much of the multiplied therapeutic means employed in the treatment of this distemper has been, as is now seen, the result of imperfect diagnosis, and confounding the disorder with other complaints of the thoracic viscera. From observing in some cases with much pain in the chest, the beneficial influence of opiates, several physicians have strongly recommended the employment of the preparations of opium as a remedy in pneumonic inflammation, and have confidently adduced cases in which the use of this drug was followed by alleviation and removal of all the symptoms. Others, and among these Cullen, disapprove of the employment of opiates in pneumonic inflammation, while the symptoms are still urgent and unsubdued by venesection and other evacuants. I have no doubt that the strong recommendation of opiates originated in confounding *pneumonia* sometimes with pleurisy, sometimes with mere rheumatic pain (*pleurodyne*), of the intercostal muscles, or spasmodic pains of the chest, (*neuralgia pectoralis*.)

The proper rule, therefore, in this as in other inflammatory diseases, is never to give opium or any of its preparations, unless after bleeding. In this manner it is beneficial even in counter-acting local inflammation, apparently by allaying irritability, and promoting the cutaneous secretion. It is given either alone, or combined with antimonial medicines, or with calomel, or with foxglove. Dr Saunders, Dr Willan, and some others were in the habit of uniting it with antimonial powder, tartar emetic, or the antimonial wine in the form of draught. In this form it almost invariably operates on the skin, which it renders moist, cool, and perspirable, and at the same time relieves the breathing, and renders the pulse less frequent. Dr Hamilton of Lynn Regis introduced the practice of combining it with calomel, which has since been adopted by Dr Armstrong and others in inflammatory diseases in general. His method was, after blood-letting, according to the violence of the disease, and the age and constitution of the patient, to exhibit a composition of from one to five grains of calomel, with from one-fourth to one grain of opium every six, eight, or twelve hours, as the symptoms required, with the liberal use of barley-water or any other vegetable ptisan. After three or four doses of this medicine in the course of twenty-four hours, sweating, or purging, or both took place with manifest relief, and in twenty-four hours more, the disease gave way, and terminated. If relief was not obtained within the first twenty-four hours, blood-letting was repeated, and the calomel and opium were continued till the disease terminated in sweating, or purging, or even ptyalism.* In some instances he added emetic tartar, and occasionally camphor to the composition.

We must not, however, listen to this unlimited and indiscriminate recommendation of calomel and opium in pneumonic inflammation. I have no doubt that the remedy was used both by Dr Hamilton and Dr Armstrong in all cases of thoracic disorders indiscriminately; and that it was beneficial chiefly in pleuritic and bronchial disorders. I have tried it according to the prescribed rules several times in pure pneumonic inflammation; but I never saw from its use those beneficial results which are represented by Hamilton and Armstrong to have followed its administration. The truth is, that its reputation as a remedy has

* Medical Commentaries for the year 1783-84, by Andrew Duncan, M. D., &c. &c. Vol. ix. p. 191. A Letter from Dr Robert Hamilton, Physician at Lynn Regis, giving an account of a successful method of treating inflammatory diseases by Mercury and Opium.

been mightily favoured by inaccurate diagnosis; or rather by no diagnosis at all; and all the testimonies as to its efficiency in pneumonia must be understood as applicable either to pleurisy, or pleuro-peripneumony, or vesicular *bronchitis*.

The unequivocal test of the efficacy of calomel and opium in the treatment of pneumonic inflammation, would be to ascertain that it possesses the property of producing absorption of red blood extravasated into the pulmonic interstitial parenchyma, or absorption of lymph effused in the same situation, or the prevention or removal of red induration, gray induration, or the absorption of purulent matter infiltrated into the pulmonic parenchyma. If it do not possess either of these properties, it has certainly as a therapeutic agent no advantage over blood-letting. If it do not possess the property of preventing morbid effusion, or removing it when it has taken place, it has little therapeutic power in this disorder. I doubt whether it possesses the power of removing by absorption extravasated blood in a greater degree than blood-letting. I know that it does not remove induration or purulent infiltration; and I am compelled to infer, that its therapeutic powers have been admitted on the grounds of inaccurate diagnosis.

Dr Beddoes appears to have been the first who insisted on the efficacy of opium combined with foxglove in pneumonic affections. Opium with twice its quantity of foxglove, according to the formula, may be given twice or three times daily.

In the gangrenous form of the disorder, no remedies hitherto proposed have been of any use. It is proper, however, to give wine and a little nutritious food, in order to support the strength. Any other treatment must be either empirical or adapted to symptoms.

When the disease has become chronic, small bleedings only are to be used. Eight or ten ounces may be taken away once or twice a week, according to circumstances; or cupping-glasses may be applied between the shoulders, so as to withdraw about the same quantity, and repeated as often as the symptoms of heat, difficult breathing, or cough appear to demand. Opium with antimonials or digitalis may be also given; and constipation is to be obviated by occasional laxatives. An issue between the shoulders is sometimes followed by marked relief, and slow but certain convalescence. Gestation is likewise a powerful means of obviating pulmonic congestion after acute inflammation has subsided; and the patient in chronic peripneumony

will do well to ride on horseback frequently, or in a carriage, or undertake a long voyage during the summer season. At the same time he ought to abstain from animal food or broths, and adhere steadily to food consisting of milk and grain, or roots, fruits, and other vegetable productions.

§. IV. *Vomica* or Abscess of the Lungs.

To complete the history of pneumonic inflammation, we add a few remarks on abscess of the lungs, and a pustular or suppurative inflammation, to which they appear to be liable. The formation of a distinct abscess of the lungs as a consequence of inflammation, was at one time generally admitted among pathologists. Laennec, however, who describes suppuration of the lungs under his third degree of pulmonary induration, maintains that it is exceedingly rare, and gives it as the result of his observation, that small abscesses are found in the pulmonic tissue not above four or five times, and an extensive one not above once, in many hundred cases. All the reported cases of pulmonary abscess, or suppuration of lung, as a consequence of inflammation, he regards as excavations or *vomicæ* formed by the softening of extensive tubercular masses. Many also, I am satisfied, are instances of chronic pleurisy terminating in *empyema* and condensed lung. It is possible that suppuration, as a consequence of inflammation of the lungs, may be rare, for two reasons; 1st, Because the disease may prove fatal by suffocation, before it has attained the complete suppurative stage; 2d, Because under the influence of remedies, it may be so much modified as to prevent the formation of purulent matter in a distinct sac or cavity. But it must not be regarded as so rare as M. Laennec appears to represent it. Instances are recorded by Morgagni, in which a considerable portion of the pulmonic tissue was converted into a purulent abscess, with the contiguous structure apparently healthy,—or indurated as a consequence of previous inflammation. Dr Baillie expresses himself with some uncertainty; for his language may be interpreted so as to apply either to tubercular *vomicæ*, or to pulmonary abscesses; though it is evident, and more especially from what he says in his engravings, that he believed in its ordinary occurrence. Is the preparation which he has delineated in his fifth engraving, p. 37, to be regarded as an instance of it? Is the case recorded by M. Foubert, in the Memoirs of the Academy of Surgery, (Tome i. of 4to, iii. of 12mo,) or that by Dr Wright in the

Transactions of the Royal Society, (Vol. xxiii. p. 1378,) or that related by Heller in the Annals of Thomann, (Vol. i. pp. 215 and 224,) to be regarded as examples of pulmonary abscess? That by Dr Wright might have been an instance of chronic pleurisy with pulmonary fistula; and there is scarcely a case which might not be explained without supposing a true pulmonary abscess. In what light are we to view the imposthumes described by Dr Bisset, in his correspondence to Dr Lettsom? (Memoirs of Life and Writings of Dr Lettsom, Vol. iii. p. 315.) On this subject evidence is defective; and several good cases, with the appearances after death are required, in order to ascertain the frequency or the general occurrence of abscess as a consequence of pneumonic inflammation.

It is impossible to doubt, nevertheless, that suppuration of the lungs, that is, the proper pulmonic filamentous tissue, does take place as an effect of inflammation of that tissue. One of the best and most distinct examples of this effect is recorded by Dr Stokes in the third volume of the Dublin Medical Journal. This gentleman found in the body of a young man who died after labouring for fifteen days under symptoms of pneumonic inflammation, a considerable collection of purulent matter beneath the pulmonic *pleura* of the lower lobe of the left lung, and between it and the bronchial tubes and vesicles of the lung,—dissecting away as it were the *pleura* from the lung, destroying, or at least converting into purulent matter, the pulmonic filamentous tissue, and leaving the pulmonic vesicles and bronchial tubes comparatively untouched. This must be regarded as not only an example of suppuration of the lung, but as proving clearly, that the seat of *pneumonia* is in the pulmonic parenchyma or filamentous tissue, as already inculcated.*

The pulmonic tissue appears to be subject to a particular form of inflammation, terminating in formation of matter, but occurring in many minute points. I have met with two or three examples only, in which, without expecting any morbid appearance, I found the *pleura* sound, the lungs interspersed at considerable distances with numerous minute abscesses, but the intermediate tissue quite healthy. As it occurred that these were softened tubercles, the whole organ was carefully examined, yet without finding any thing but minute spherical abscesses of various sizes, and with the surrounding texture natural. The

* Dublin Journal of Medical Sciences, Vol. iii. Contributions to Thoracic Pathology, by Dr Stokes, p. 51.

peculiarity, therefore, of this species of suppuration, is its not being preceded, so far as could be ascertained, by tubercles, the pulmonic tissue neither inflamed nor indurated, and the simultaneous formation of many purulent points.

This change Dr Baillie mentions in the following terms.

“ I have sometimes seen a number of small abscesses interspersed through the lungs, each of which was not larger than a pea. The pus there is rather thicker than what arises from common inflammation, and resembles scrofulous pus. It is probable that these abscesses have been produced by a number of small scattered tubercles taking on the process of suppuration. The lungs immediately surrounding these abscesses are often of a perfectly healthy structure, none of the cells being closed up by adhesions.”

Notwithstanding the opinion of this pathologist, that these were the result of scattered tubercles, it may be argued, that had this been the case, some unabscessed tubercles might have been expected to be found, or the surrounding tissue might have been supposed to be indurated after such a slow and tedious process as the tubercular softening. Nothing of this kind, however, was remarked in the few cases which have come under my own notice, nor does the description of Dr Baillie himself warrant any such conclusion. In the cases which fell under my own observation, I believe them, from the circumstances, to have been produced by suppuration within the veins of the lungs. One took place after venous inflammation consequent on blood-letting.

§. V. Inflammation of the Heart. *Carditis. Cardite.*

Senac, *Traité du Coeur*, Liv. iv. Chap. vii.—An Inquiry into the Symptoms and Treatment of *Carditis* or the Inflammation of the Heart; illustrated by cases and dissections. John Ford Davis. M. D., &c. Bath, 1808.—*Essai sur les Maladies et les Lésions Organiques du Coeur et des Gros Vaisseaux*. Par J. N. Corvisart, Baron, &c. Sieme Edition. Corrigée et augmentée. A Paris, 1818.—A Treatise on the Diseases and Organic Lesions of the Heart and Great Vessels. By J. A. Corvisart, M. D., &c. &c. &c. Translated by C. H. Hebb, M. R. C. S. London. London, 1813. Fourth Class, Section I. p. 210.—A Treatise on the Diseases of the Chest, &c. &c. Translated from the French of R. T. H. Laennec, M. D., &c. with a Preface and Notes, by John Forbes, M. D., &c. London, 1821. Book Third. Chap. i. Sect. ii.—The Morbid Anatomy, &c. By Matthew Baillie, M. D. Chap. ii. p. 19.—Case of Inflammation of the Muscular Structure of the Heart, by Edward Stanley, Esq. Assist. Surg. to St Barthol. Hospit. *Medico-Chirurg.* Vol. vii. 323. London, 1816.

THE name of *Carditis* was early applied by nosologists to denote inflammation of the substance of the heart. The testi-

mony of Dr Baillie informs us that this is a rare disease, and is almost never primary, but connected with inflammation of the pericardium, especially in that portion of it which forms the serous covering of the heart. In this case the inflammatory action sometimes passes a little way into the substance of the organ, probably the cellular tissue, which connects the serous covering to the muscular substance; the part is more crowded with vessels than in the natural state, and occasionally a few spots of extravasated blood are seen. The general accuracy of this statement is confirmed by Laennec, who contends, that though partial inflammation or small inflamed spots of the heart are not uncommon, yet general inflammation of the organ, either acute or chronic, is a thing almost unknown in the records of medicine, and considers the cases detailed by Corvisart as examples of pericarditis, attended with the discoloration which so generally accompanies this membranous inflammation. The same may be said of the cases of Dr Davis. At the same time he does not deny the possibility of the fact, which he admits is established by the case described by Meckel, (*Memoires de l'Academie de Berlin*); but he considers this case as affording no satisfactory information on the nature or symptoms of the disease; and adheres to his opinion, that no certain proof of inflammation of a muscular organ like the heart can be found unless in the deposition of purulent matter among its fibres.

According to this accurate observer, partial inflammation, or that which is confined to a small space of the organ, is the most usual form of the disease; and this process generally terminates in the formation of an abscess or ulcer of the cardiac substance. Many examples of this are recorded by Bonetus; and Olaus Borrichius, Malpighi, and Peter Marchetti, met with cases of partial abscess or ulceration of the parietes of the heart. In one case seen by Laennec, an abscess in the walls of the left ventricle, in a child of twelve, as large as a filbert, was complicated with inflammation of the pericardium; and in another, of a man of sixty, the same physician found an albuminous exudation of the colour of purulent matter, and, like boiled white of egg, deposited among the muscular fibres of the left ventricle. In this instance it is worthy of notice, that the morbid change was not indicated by any positive sign. The individual exhibited symptoms of acute inflammation of the chest, among which the most prominent were *orthopnœa* and inexpressible anguish, but without any sign of the precise situation of the malady.

Ulcers, both on the external and internal surface of the heart, have been observed perhaps more commonly than abscess ; but the characters of this morbid change have not been very correctly noted ; and in some instances the rough and unequal surface of a patch of coagulable lymph has been mistaken for an ulcer on the outer surface of the organ. Examples, however, of true breaches produced by ulceration are recorded by Olaus Borrichius, Peyer, and Graetz, by Valsalva, Morgagni, Albertini (Epist. xxv. 21, 24.) and Lieutaud ; and an excellent instance of the lesion is recorded by Pelletan. (Cl. Chir. iii. p. 160.) More numerous instances of ulcers in the inner than in the outer surface of the heart are recorded by authors ; and many are found in the collections of Bonetus and Morgagni. Laennec met with one in which an ulcer, one inch long, half an inch broad, and more than four lines deep in the centre, was found in the inner surface of the left ventricle, which was in a state of hypertrophy, and at length was ruptured.

From these facts, as it is impossible to conceive an abscess or ulcer to be formed without some degree of inflammation, it must be inferred that the substance of the heart is liable to this process ; but it is also evident, that it is more prone to partial or circumscribed inflammation, or at least to inflammation developed in, and confined to, a small spot or spots, than to general spreading or extensive inflammation. It may, however, be remarked in opposition to this doctrine, that the local or limited site of an abscess or ulcer by no means proves the kindred nature of the inflammatory process which preceded it ; and it is not unreasonable to say, that an extensive inflammation may in its progress be concentrated towards a single spot, at which it will terminate in suppuration, while the contiguous parts are abandoned by it, and saved from the same destroying power. On this head I cannot enlarge further ; and I only observe, that pathology requires many correctly observed cases and dissections of inflamed heart, with or without abscess, before it be possible to draw any certain conclusion on the local or general character of the inflammation, or on the positive or negative character of the disease.

Laennec, however, has been misled by his ignorance of English medicine ; and he might have found the very test of cardiac inflammation which he requires in a case recorded by Mr Stanley in the seventh volume of the Transactions of the London Medico-Chirurgical Society. In this instance, the cut substance

of the heart was exceedingly dark-coloured, almost black, depending, in Mr Stanley's opinion, on the nutrient vessels being loaded with venous blood. The fibres were very soft and loose in their texture, being easily separable, and compressible between the fingers. The cut surface exposed in the section of each ventricle exhibited numerous small collections of dark-coloured purulent matter in distinct situations among the muscular fasciculi,—some deep, approaching the cavity of the ventricle, others superficial, and raising the pericardium from the heart. The muscular substance of the auricles was also softened, and loaded with blood ; but without collections of purulent matter.

The symptoms to which *carditis* gives rise are so vague, uncertain, and inconstant, that Corvisart divides the disease into *occult* or *latent*, and *manifest* or *distinct*. In the first kind of cases, the sensations and complaints of the patient indicate an affection of the chest only, but do not denote the presence of any local or positive disease of the heart. In the latter kind of cases the symptoms, though not uniform, indicate, however, more distinctly some injury of the organ and lesion of its function. In one case, these symptoms consisted of acute pains in the region of the heart, and sensations of anguish, which prevented the patient from attending to his ordinary duties. In another, palpitations and unutterable heat in the left side of the breast succeeded by anxiety, mortal fainting, and death on the sixth day were the distinguishing signs. In a third, a sense of compression of the heart was added to the common signs of pectoral disease ; dull, heavy pain and difficult breathing, and followed by fainting (*leipothymia*) and death.

Baillie looks on the symptoms attending inflamed heart as very similar to those attending inflammation of the pericardium, and is of opinion that the two diseases are very often blended together. This, of course, gives little information on the diagnostic means, which, indeed, practically speaking, is of small importance. From his description, however, I take the enumeration of the symptoms by which the disease is distinguished. These may be said to be of three kinds, as they occur in the organs of respiration, in the functions or properties of the heart, and in the general affection of the whole system. Of the first kind are difficult breathing (*orthopnœa*), and cough, sometimes hiccup ; of the second kind are pain in the region of the heart, palpitation, and irregular action of the heart, irregular pulse, distressing anxiety, and in some instances fainting, (*syncope*) ;

of the third kind are the quick, strong, sharp pulse, hot dry skin, thirst, raving, and sometimes general uneasiness and restlessness (jactitation.) Of all these symptoms, the only one which appears to Baillie to be connected principally with disease of the heart is the fainting (*syncope*), which he thinks may not occur in pure pericardial inflammation. When, therefore, to the general signs which denote inflammation of the chest, as difficult breathing, cough, and symptomatic fever, there is added syncope, with or without palpitation and irregular pulsation, it may be presumed that the disease affects the substance of the heart, and that, if not spontaneously ceasing or subdued by art, it will terminate in abscess, ulceration, or other organic injury to the substance of the organ.

It is to be regretted, however, that, notwithstanding the apparent accuracy of these semiological views, they are rendered quite insignificant by the authority of Laennec, who, as we have seen, denies the existence of carditis as a general affection of the heart, and gives no history of symptoms whatever; and farther asserts, that, in the present state of knowledge, it is impossible to ascertain the existence of either abscess or ulcer of the heart. All that can be said on this question is, that this uncertainty probably depends on imperfect or insufficient observation; and it is to be hoped that more correct acquaintance and greater experience with the phenomena and effects of the disease, will render our knowledge more certain and positive.

In the case recorded by Mr Stanley, which took place in a boy of 12 years, the chief symptoms were those of intense inflammatory fever, with great heat, delirium, and sleeplessness, and a little frontal headach. On one day he complained of pain in the thigh and knee; but at no time in the whole course of his symptoms, which lasted only four days, did he give any indication of pain in the chest. Death was preceded by difficult breathing.

In this place, where we have been considering inflammation of the cardiac tissue, and its termination in abscess or ulcer, it may be not improper to bestow some attention on an effect or consequence of ulceration not common. This is the progressive thinning or destruction of the walls of any part of the organ, to such extent as to give way, or form what has been named rupture of the heart. This is said by Corvisart to be partial or complete, according as the laceration passes through a portion or the whole of the fleshy substance of the heart.

Portal relates a case of rupture without erosion or ulceration. From the cases, on the contrary, recorded by Murray, Erdmann, Langlade, Brera,* Frank, Corvisart, Kreysig, and Schina, this is very rare, almost invariably the consequence of ulceration, and there is scarcely an authentic example of its occurrence in consequence of violent exertion. Yet instances are stated to have occurred after a violent effort, a fit of passion, of epilepsy, or in the venereal act, which were probably merely exciting causes. The rupture is represented by Portal and Corvisart to take place generally not in the right ventricle toward its apex, as might be imagined, but in the left ventricle ; but Frank states that, among seventeen cases, eight took place in the right and nine in the left ventricle. The substance of the heart is generally soft, friable, and blackish.

Corvisart gives examples of rupture of the tendons and fleshy pillars of the valves, occurring after violent efforts in lifting great weights, &c. The immediate result was a sudden and intense feeling of suffocation, which terminated in the usual symptoms of disease of the heart.

When there is reason in thoracic inflammation to suspect the presence of inflammation of the heart, the antiphlogistic measures must be pursued with the utmost promptitude and energy, and foxglove or tartarized antimony should be administered in order to moderate the inordinate action.

§. VI. Inflammation of the Liver. Liver Disease. Liver Growth. Ague Cake. *Hepatia. Hepatitis Chronica.* Chronic Inflammation of the Liver. *Inflammatio Jecinoris. Hepatitis suppurans. Puro-hepatitis*, Mr G. H. Bell. *Hepatalgia apostematosa.*

Pathological Inquiries and Observations in Surgery from the Dissections of Morbid Bodies, &c. By Richard Brown Cheston. Gloucester, 1766. Chapter iii.—Essay on a Disease of the Liver common in hot Climates. By J. Crawford. 8vo. London, 1772.—An Enquiry and Observations on the Diseases which prevail in Long Voyages to Hot Countries, particularly in those of the East Indies, and on the same Diseases as they appear in Great Britain. By John Clarke, M. D., &c. Newcastle. First edition, London, 1773. Second edition, London, 1792. Chapter, Observations on Hepatitis or Diseases of the Liver, p. 403.—Observations on Hepatic Diseases incidental to Europeans in the East Indies. By Stephen Mathews, Surgeon to the H. E. I. C. Service, &c. London, 1783. 8vo, Chapter viii. p. 136.—Histories of Cases of Abscesses in the Liver ; with Observations on the effects of opening them. By Dr James Clark of Dominica, &c. Medical Commentaries. Decade second, Vol. iv. p. 317. Edinburgh, 1790.—A Treatise on the Structure, Economy, and Diseases of the Liver, together with an Enquiry into the Properties, &c. By

* Val. Aloysii Brera de Extraord. cordis Ruptione Obs. Sylloge T. x. vi. p. 202.

William Saunders, M.D., F.R.S. Second edition. London, 1795. Chapter iv. p. 197. Third edition. London, 1803. Chapter iv. p. 259.—Med. Com. Dec. ii. Vol. i. p. 353. The History of a singular Affection of the Liver, which prevailed epidemically in some parts of the West Indies. By Mr C. Chisholm, Surgeon at St George's, Grenada—An Account of the Diseases of India, as they appeared in the English Fleet and in the Naval Hospital at Madras in 1782 and 1783, with Observations on Ulcers and the Hospital Sores of that country, &c. By Charles Curtis, formerly Surgeon of the Medea Frigate. Edinburgh, 1807. 8vo, p. 89—117.—A Practical Treatise on various Diseases of the Abdominal Viscera. By Christopher Robert Pemberton. Second edition. London, 1807. Chapter ii. p. 38.—Practical Observations on Fever, Dysentery, and Liver Complaints, &c. By George Ballingall, M.D., F.R.S.E. First edition, 1818. Second edition, 1823, p. 95.—Observations sur la Nature et le Traitement des Maladies du Foie. Par Antoine Portal, Prof. de Medecine, &c. &c. Paris, 1813. premier partie, p. 217, Chaptre vii.—On Liver Complaints and Bilious Disorders. By John Faithorn. Fourth edition, 8vo. London, 1820.—Notes on the Medical Topography of the interior of Ceylon, &c. with brief Remarks on the prevailing Diseases. By Henry Marshall, Surgeon to the Forces. London, 1821. Chapter ii. p. 145.—Researches into the Causes, Nature, and Treatment of the more prevalent Diseases of India and of warm climates generally. Illustrated with cases, &c. By James Annesley, Esq. of the Madras Medical Establishment. In two volumes. London, 1828. Vol. i.—Clinical Illustrations of the most important Diseases of Bengal, with the result of an Inquiry into their Pathology and Treatment. By William Twining, M.R.C. Surg. London, &c. Calcutta, 1832. 8vo, Chapter ii. p. 135. Second edition, two vols. Calcutta, 1835, 8vo, Chapter iii. Vol. i. p. 227.—Observations and Cases illustrative of the Pathology of the Abdominal Viscera in some forms of Indian Disease. By C. Morehead, M. D. Bombay Medical Establishment. Edin. Med. and Surg. Journal, Vol. xxxvii. 1832, p. 308.—On the Climate of Bangalore and the prevalence of Hepatitis at that station. By J. Mouat, M. D. Surgeon H. M. 13th Light Dragoons. Transactions of Medical and Physical Society of Calcutta, Vol. vi. p. i. Calcutta, 1833.—On Abscess of the Liver in European subjects at the Madras Presidency. By W. Geddes, Surgeon Madras Service. Trans. Med. and Phys. Society, Calcutta, Vol. vi. p. 294. Calcutta, 1833 —A Treatise on the Diseases of the Liver and on Bilious Complaints, &c. By George Hamilton Bell, F. R. C. Surg. Edinburgh. Edinburgh, 1833, 8vo. ii. Puro-Hepatitis.

INFLAMMATION of the substance of the liver has been generally, since the time of Cullen at least, believed to be of a chronic nature; and doubtless the trifling or obscure symptoms which appear in cases, in which dissection discloses a considerable abscess of the organ, are highly favourable to this opinion. For, independent of the avowed difficulty of ascertaining the existence of what has been termed chronic *hepatitis* during life, almost all authors abound with examples of abscess of the organ discovered on dissection, yet in which no decisive symptom had led to the suspicion of such an event. The truth of this I can verify by personal testimony. Various reasons, however, lead me to doubt whether hepatic inflammation is invariably chronic; and several facts prove that it assumes, under certain circumstances, a sufficiently acute form.

1. In the tropical regions, inflammation of the hepatic substance is often attended with acute pain, quick pulse, and all the marks of a violent disease; and unless remedies be seasonably and energetically employed, suppuration takes place in a period sufficiently short to warrant the opinion of the inflammation being acute, (Clark, (Med. Com. xiv. p. 322,) Ballingall, Marshall). 2. In tropical countries, also, there are two forms of hepatic inflammation,—one acute, rapid, and with well-marked symptoms, the other slow, long-continued, and with indistinct symptoms. 3. Though, in temperate climates, this disease is undoubtedly milder, slower, and less violent than in countries where the atmospheric heat is excessive, yet instances are not wanting in which the disease appears with distinct symptoms, runs a rapid course, and terminates in more or less extensive suppuration. It is true that the distinction, according to duration or severity of symptoms, is liable to be vague and undefined; but it is the only one which is pretty obvious, and which is often useful in practice. 4. Lastly, both in temperate and hot climates one form of inflammation of the liver consists in a slow and gradual enlargement of the gland, which appears to depend on chronic congestion, if not inflammation, without tending to suppuration, but mere hardening.

From these facts, it may be inferred that hepatic inflammation is of two kinds, suppurative and unsuppurative; that the former, which is analogous with the phlegmonous inflammation of Cullen, Smyth, and others of the same school, may be acute or chronic, severe in character, and rapid in progress, or moderate in action, and slow in progress; that the latter is always chronic, unless, when, under certain circumstances, it may suddenly pass into the acute form; and that, though all forms of the disease may occur in temperate countries, yet warm or tropical regions are the situations most common for the several forms of hepatic inflammation. I enumerate, according to these principles, the following varieties.

A. Acute suppurative; B. chronic suppurative; C. acute congestive or enlarging; D. chronic congestive or indurating.

A. Of the first the best examples are afforded in the cases of Dr John Clarke, occurring in the East Indies, Dr James Clarke, occurring in Dominica, those of Sir G. Ballingall, Mr Annesley, and Mr Geddes, in the East Indies, and those of Mr Marshall in the Island of Ceylon. Its most common symptoms are more or less pain in the right hypochondriac or epigastric re-

gion, tenderness in some part of the side, difficulty or pain in lying on the right, sometimes on the left side, sickness, vomiting, heat, thirst, quick strong full pulse, and constipation, with scanty high-coloured urine. The pain is generally increased on pressure; but, in some instances, there is merely an undefined sense of soreness or of weight, or of gnawing emptiness, deep in the right hypochondriac and towards the epigastric region. These sensations are generally aggravated by lying on the left side, in some instances by lying on the right side, and occasionally no ease is procured unless when the patient is on his back. It is probable that this variety of complaint depends on the part of the organ most severely affected. The aggravation caused by lying on the left side appears to denote that the left lobe is inflamed; that resulting from lying on the right side denotes inflammation of the right lobe, each being respectively pressed by the weight over a tender and inflamed part; while the ease derived from the supine position indicates a deep-seated inflammation verging towards the upper obtuse margin, and the concave surface of the organ. The sickness, vomiting, and constipation are not constant symptoms; but if present with local pain and quick pulse, denote the disease, with considerable certainty, as extending to the concave surface. The heat, thirst, quick strong pulse, and scanty high-coloured urine are merely connected with the general feverish state of the system. It rarely happens that, in this form of hepatic inflammation, there is sufficient enlargement or hardening of the organ to cause a sensible increase in the bulging of the hypochondriac region. This only occurs towards the latter end of the disease, when it threatens to terminate in suppuration, or to pass into the chronic form. Clark of Dominica considers inability to sneeze as a certain sign of the malady.

The acute hepatic inflammation terminates, *1st*, in resolution; *2d*, in suppuration; *3d*, in induration or chronic inflammation.

Termination by resolution is when the symptoms gradually decline either spontaneously or by the use of suitable remedies, and the patient is restored to health without further complaint. If the resolution be spontaneous, it is generally accompanied by some evacuation, for instance, hemorrhage from the nose, or from the intestines, diarrhoea, critical sweating, or a copious sediment in the urine. Saunders states that he has seen a great increase of bronchial secretion attend the resolution of this dis-

ease ; and perhaps this is an instance of transfer of morbid action.* Termination in suppuration is more common, and is fatal either speedily or more slowly. In the former case the right or left lobe is converted into a large abscess or collection of matter, purulent, sero-purulent, or purulent with masses of flaky lymph. If the whole hepatic tissue be not destroyed in this manner, the inner surface of the abscess is somewhat irregular, having the appearance of an ulcer thickly covered with purulent matter, or flaky lymph. The substance of the organ for about a third of an inch from the ulcerated surface appears unusually red, and may be hardened a little, but beyond this the glandular substance is healthy. In some instances the hepatic substance is destroyed or entirely removed at one spot or over a great extent, and the purulent fluid is contained in a sac formed by the peritoneal coat. The quantity of purulent fluid varies from one to seven pounds, the most usual quantity being about two or three pounds. At the same time the contiguous hepatic substance is denser, larger, and heavier, and weighs, exclusive of the purulent matter, from one to three pounds more than in the healthy state it would do. This increase in bulk and weight is occasioned partly by blood in its capillary system, partly by new products from the blood, causing swelling or enlargement of the organ.

When a considerable abscess of one or both lobes has formed, death generally takes place very quickly, apparently in consequence of the feebleness and waste of vital power induced by a violent disease. If, however, life is protracted a little, the purulent collection increases in size, and finds its way to the surface of the organ. Ulceration of the peritoneal covering takes place at one or more points, and the contents escape by the openings. An abscess may in this manner be discharged ; 1st, into the abdominal cavity ; 2^d, through the diaphragm into the air-cells of the lungs ; 3^d, by the adhesive process into some part of the intestinal canal, the stomach, transverse arch of the colon, or even the duodenum ; 4th, by the same process to the outer surface of the body.

1. When the matter escapes into the abdominal cavity, it produces immediate peritoneal inflammation, generally terminating fatally. This termination is most usual when the abscess is seated about the posterior inferior surface, and the

* A Treatise on the Structure, &c. p. 208.

acute margin of the gland. This is believed to be a rare termination.*

2. If the collection be seated about the upper surface and right lobe of the organ, the liver, diaphragm, and lungs become united by adhesive inflammation, and the matter passes into the air-cells, from which it is discharged by expectoration with frequent coughing. In fatal cases the hepatic portion of such an abscess presents a wide hollow, to the margin of which the lungs and diaphragm are firmly attached; the muscular structure of the latter is destroyed to the extent of the ulcerated surface, and the lungs are hardened, and void of crepitation. This termination is generally fatal in a short time. The symptoms become complicated with those of pulmonary consumption, and the patient is worn out by incessant irritation, difficult breathing, coughing, and hectic emaciation. Yet, according to Marshall, recoveries from this state have occurred; they are indeed rare, and perhaps occur only when the abscess is small, and the consequent inflammation of the lungs not extensive. (Vide John Clark, p. 405, 407.)

3. Mr Marshall mentions a case in which the left lobe adhered to the stomach, and part of the contents of an abscess had passed through a large opening into its cavity. Sir G. Ballin-gall states, that, in many instances, extensive adhesion takes place between the liver and transverse arch of the colon, and though he never met with a case in which an opening was effected, yet infers that it has taken place, so as to discharge matter and effect a cure. Mr Marshall adheres to the mere fact of no communication ever being formed, and is not aware of a cure having been accomplished. Dr John Clark, however, records a case which he considers, from the discharge of purulent matter, to have been of this nature (p. 416.)

4. Among the cases of hepatic abscess related by Valsalva, in one the biliary duct communicated with the abscess by a large orifice, and was considerably dilated. Morgagni infers, that there is no reason to doubt that this duct frequently conveys blood and purulent matter from the substance of the liver into the duodenum; and he mentions that, in a case in which many pounds of purulent fluid were voided at different periods during life, much matter was found after death in the intestines,

* Vide Bang Selecta Diarii Havniensis, Tom. ii. p. 65, where a case and dissection is given.

biliary ducts and liver, and the ducts were much dilated, the intestinal extremity being large enough to admit the little finger. (xxxvi. 10.) The probability of this mode of outlet in consequence of purulent matter being formed either in the vicinity of the ducts, or in the concave part of the liver, is afterwards noticed by Saunders; but he appears to have been misled by speculative views, and to have inferred that, because adhesion generally attends suppuration and ulceration, it was difficult to explain the mode in which the hepatic abscess made its way into the duodenum, and falls into some philosophical inconsistencies. (See Chap. iv. Sect. i. 7-13.)

5. The passage of an hepatic abscess to the surface of the body appears to be uncommon; and its spontaneous opening by ulceration of the integuments almost unknown. Clark of Dominica records several cases in which, by an external incision, he discharged considerable quantities of matter (1, 2, 3, quarts, half a gallon, a pint, &c.) sometimes so as to effect a permanent cure. Marshall, however, states that no case occurred in the Kandyan country among any of the classes of troops in which it was deemed advisable to make an incision through the abdominal parietes into an hepatic abscess; and in those cases in which bulging of the false ribs appeared to indicate the performance of this measure, it was found on dissection that adhesion was not sufficiently intimate to render it successful. In three cases in which the abscesses were small, the operation was performed with good result.

The termination of acute hepatic inflammation in hardening or chronic disease shall be noticed afterwards.

Acute suppurative inflammation of the liver may be said to be endemial in tropical climates. It is so in the West Indies; in India but particularly the Coromandel Coast (John Clark;) in the Mysore, especially at Bangalore, (Mouat;) and in the whole of the Presidency of Madras; in Ceylon, (Marshall;) and on the coast of Africa, (Winterbottom.) It may occur, however, in temperate or cold climates. Morgagni mentions examples in Italy, Portal in France, and Bang in Denmark. (See *Selecta Diarii*, p. 62, 224, 285, 315.) Two cases have fallen under my observation in this country.

It attacks indiscriminately natives and Europeans, but especially the latter in the East Indies. In Dominica, the negroes were as frequently attacked as the whites. Not unfrequently it succeeds ague or remittent fever, or may be complicated with

them. Exposure to cold, moisture, or extreme heat appears equally to favour its production.

B. Chronic suppurative hepatic inflammation differs from the acute in its mode of attack, the degree of severity, and its effects on the substance of the organ. It generally comes on slowly and insidiously, either originally in constitutions previously exhausted by long residence in hot climates, and repeated attacks of acute disease, or it follows remittent fever or ague. The patient is languid, listless, averse to exertion either bodily or mental, and sometimes apprehensive. Yet he does not complain of pain, or that distressing uneasiness which attends the acute disease. The hypochondriac region, on the contrary, may be insensible, or the seat of a gnawing sense of emptiness. At the commencement it is not enlarged or prominent, but becomes so as the disease advances. The pulse, at first slow and natural, becomes afterwards quicker, varying from 90 to 100, and sharpish; the skin is cold, and dry or unctuous; the tongue furred; the complexion sallow, and the look anxious. The appetite is variable, at one time apparently good, at others completely gone, while squeamishness and even vomiting may succeed. The matters discharged are chiefly tough phlegm, with disordered bile and the portions of food eaten. At the same time, the patient is hot, thirsty, and restless. The bowels are generally bound; the stools darker or lighter than natural; afterwards they are loose, frequent, and lienteric. The urine is scanty, depositing a copious red flaky sediment.

But the most distinguishing character of this disease is, that whatever variation these symptoms may present, and however obscure they may be, there is a distinct accession of fever during the night. The pulse may be calm and of natural frequency, the skin may be cool, and the sensations of thirst and hunger may be natural during the day;—in the course of the night the skin becomes hot, the face reddish, the pulse strong and frequent, the mouth dry and parched, and the patient is restless, or enjoys only disturbed slumber; as morning advances slight sweating comes on, with abatement of his sufferings and tolerable sleep. If the disease is not arrested, all the symptoms, and especially those of night fever, become more severe and distressing; the patient tosses about in bed with a dry burning skin, and scalding palms, constant and insatiable thirst, and, in some instances, a severe husky cough; his nights become sleepless, and it is only in the morning, after the urgent complaints are relieved by partial

sweating, that he falls into a laboured, interrupted, and unrefreshing slumber. His strength and flesh waste, his appetite decays, and he at length sinks into hectic, which shortly terminates in death.

Dissection shows, instead of an abscess of considerable size, several small distinct collections of purulent matter similar to the small abscesses (*vomicæ*) of the lungs. They may be very numerous, and not larger than peas, or fewer in number, and as large as a hen's egg. The whole mass of the liver is altered in colour; it appears as if parboiled, and its texture is firmer than natural, giving when cut the sensation of the knife passing through a soft cartilaginous mass. Very little blood issues from the incision. In some instances the surface of the organ is sprinkled with white spots of various dimensions, or tubercles are interspersed through its substance. These appearances may be conjoined with hydatids; but these are rarely met in the disease as it occurs in India. The bile differs from healthy bile in a slight change of colour or consistence; but it has not been chemically examined. The gall-bladder seldom presents any change of structure, or is merely thickened in its coats.

This form of hepatic inflammation is very common in India, especially in those who have resided long in the country, who have been exposed to the causes of ague and fever, or whose habits have been rather intemperate. It is not unknown, however, in European countries; for Bang describes an instance of it in his Copenhagen Reports, occurring in the month of April 1783, and with symptoms somewhat acute. (Tome i. p. 88, *Selecta Diarii Havniensis*.) Two instances have come under my own notice in this country.

In various instances of the disease, a single large abscess is formed in the liver without acute symptoms, or with the usual train of chronic complaints. I had occasion in 1827 to examine the body of an aged person who had been labouring for about five or six weeks under symptoms of inflammation of the intestinal mucous membrane, and in whom, besides the usual traces of disease in the colon, I found a large abscess in the right lobe of the liver, containing fully four pounds of purulent matter, mixed with lymph flakes. To this head Mr Andree's case in the Transactions of the Medical Society appears to belong. "The formation," says Mr Marshall, "of a large abscess in the liver sometimes takes place without much indication of disease, in as far as the feelings of the patient are

concerned. So little obvious occasionally are the symptoms which indicate a large accumulation of pus in that organ, that the pointing of the abscess outwards has been mistaken for a superficial collection, and an opening made into it by means of a lancet. The issue of three or four pounds of purulent matter undeceived the operator." (P. 155.) Are such collections to be regarded as the result of chronic inflammation, or of a scrofulous disease of the liver, as they are in other organs? A peculiar modification of hepatic suppuration is described by Sandifort in the eighth chapter of the second book of his *Academical Researches*.

C. I have made a distinct head of *acute congestive inflammation*, for the purpose of referring to it an affection of the liver, which is described by Dr Chisholm, as prevailing epidemically in some parts of the West Indies. The disease began with headach, pain at the pit of the stomach, general languor, and a sense of lightness and oppression at the breast, with difficult breathing. The skin was dry, harsh, and cool; the tongue moist and foul, without thirst; the belly natural; the urine freely secreted; and the pulse was soft, about 70 or 80 in the minute, and of natural fulness. In some cases the pulse was quick and hard from the first, the skin hot and dry, and some swelling of the belly, especially at the umbilical region, was remarked. The pain varied in situation, being some time confined to the right hypochondriac and epigastric regions, in other instances extending from these to the shoulder, especially the right, across the belly to the naval, or from the naval through to the spine. It was remarkable, that, when the pain was fixed, it was felt in the left side, under the false ribs.

In about two days the headach increased much, but without giddiness; the pain at the pit of the stomach became more excruciating; and shivering came on, with chilness of the skin to the touch, but an intense burning sensation when pressed strongly. The tongue was covered with a thick moist fur, purplish at the edges; the cheeks, nose, and eyebrows assumed a copper hue, exuding large drops of sweat, while the skin, in general, was covered with an unctuous moisture; the pulse rose from 80 to 120 or 140; dry cough, or rather a sudden catching mode of expiration, with a sense of compression of the lungs, came on; and about the sixth day, all the symptoms increasing, the skin became cold and clammy, the pulse exceedingly quick and

small, deglutition became difficult, and coma came on, terminating in death.

On dissection the liver was found greatly enlarged, its surface, especially the convex, was clouded irregularly with red, purple, and tallow-coloured spots; the peritonæum sound and transparent. The hepatic substance was of natural consistence, without any appearance of suppuration, but so much enlarged as to occupy in eight of ten cases not only the right hypochondriac and epigastric region, but the left hypochondre. Its vessels were enlarged, but empty. These appearances seem to arise from an unusual accumulation or congestion of blood in the liver. It appears to be the same described by Marshall at p. 146, and which he regards as a passive engorgement of the vascular system of the gland.

This sort of hepatic inflammation prevails occasionally as an epidemic in Grenada, Dominica, and others of the later settled islands. Although persons of all colours, ages, and of both sexes may be attacked, yet blacks and young people from eight to twenty-five years are most liable.

D. To the fourth head, or that of chronic congestive inflammation, may be referred those examples of liver disease, in which the organ becomes slowly indurated, generally with enlargement, sometimes without, but always with obscure symptoms of ill health, until the structure of the organ is so generally changed, that it is no longer fit for its functions of receiving the venous circulation, or performing the secretion of bile. The symptoms of this disease are so similar to those of suppurative inflammation, that it is impossible in the present state of knowledge to attempt a complete history. The principal, according to Pemberton, are a sense of weight and dull pain in the right side, weary heaviness of the right arm, and frequently pain at the top of the shoulder. The tongue is usually whitish, the appetite impaired, the countenance sallow, and the bowels slow, and stools clay-coloured. The pulse is about 90, almost invariably intermitting, and there is a sensation of fluttering at the pit of the stomach,—symptoms which Pemberton ascribes to the impeded motion of the arterial and venous blood through the hardened gland. These symptoms, however, it may be remarked, appear only when the disease is far advanced, when the natural structure is much injured.

The organ is harder than natural, and when cut gives a gristly sensation. Its surface is mottled, irregular, and marked with

depressions not unlike *cicatrices*. Its substance is also generally paler than natural, and, if immersed in clear water, appears quite different from the sound state. It is traversed with gray or light-coloured particles, which seem to be infiltrated between the *acini*, or glandular granules. In some instances it is possible to distinguish between the *acini* a bluish-gray firm sort of substance, which is indurated cellular tissue. Not unlike, perhaps, is the hard state of liver observed in drunkards. Mr Marshall describes them as yellowish, containing little blood, and communicating a gristly sensation, when divided, sometimes loose and granular, at others solid and tenacious, weighing generally 5 pounds.

Such a state of the liver gives rise to all the symptoms of imperfect digestion and impaired nourishment, and eventually terminates in dropsical effusion within the *peritonæum* (ascites,) or uncontrollable hemorrhage from the mucous surface of the intestinal canal.

This disease may succeed the acute form, or may be developed slowly and insensibly after ague, remittent fever, or in the persons of those accustomed to the use of spirituous liquors. It is certainly a common disease in tropical climates, but is by no means unknown in more temperate latitudes. It is much seldomer found in females than in males.

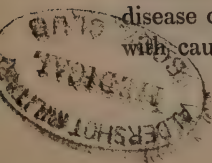
TREATMENT.—The treatment of hepatic inflammation is to be regulated by the severity and urgency of the symptoms, and by the form of the disease which they indicate.

The acute form is to be treated promptly and actively by copious blood-letting, repeatedly practised if requisite, local bleeding, blisters, cathartics, and the rigid adoption of every part of the antiphlogistic regimen. The great object is to prevent supuration, for if this takes place, the disease is generally fatal. To prevent such a result, therefore, it is requisite to take from the arm twenty, twenty-five, or thirty ounces of blood, and either repeat this, or at least take fifteen ounces more, until the pain is gone, the pulse natural, the skin cool, and the patient can lie with ease on either side. The bowels must be freely opened by castor oil, the neutral salts, infusion of senna or calomel; but the use of the latter as an alterative is not to be adopted. If pain or weight still continues, when the pulse and other functions have become natural, cupping or leeches may be resorted to, afterwards the application of a large blister will materially expedite the cure. In the acute congestive, bleeding is still more urgent, and is almost the only remedy to be relied on.

In the chronic form of the disease, after one bleeding of fifteen or twenty ounces, small local bleedings will be the most useful remedy. These, however, should not be carried to a great extent; for they do not appear to have so much influence on the disease as blisters, and the frequent or constant use of cathartics. A blister, about four or five square inches in size, should be applied once in the week on the right hypochondre; and in some instances it may be expedient to form a caustic issue of the size of half-a-crown, as near as may be to the seat of pain. The purging, which should be suited to the strength of the patient, may be effected either by Cheltenham water, or the evaporated salts, or by three drachms of Epsom or Rochelle salt every morning in spring water, Seidlitz water, or any other agreeable vehicle. In some instances the use of mineral waters, saline, chalybeate, or sulphurous, has been followed with considerable relief to chronic liver symptoms. When it is thought expedient to try this method of management, the patient should, if able to undergo the journey, repair to Cheltenham, Harrogate, or any other efficient mineral spring in England, or to Peterhead, Pitcaithly, Dumblane, or Moffat in Scotland.

Diuretic medicines have some influence over chronic inflammation of the liver; and it is on this ground perhaps that dandelion (*Leontodon Taraxacum*,) which is strongly recommended by Pemberton, is found to be useful. The form in which he administered it, was half a drachm of the extract suspended in an ounce and a-half of peppermint water, given at noon and at bed-time. If the recent plant can be obtained, which is only from the end of April to the middle of July or beginning of August, the decoction of the roots may be used, combined with nitrate of potass or any other neutral salt in small doses.

Mercury has been long and much commended in the treatment of diseases of the liver. It is not suited, however, to all forms of hepatic inflammation, and it requires to be used with discernment and caution, not only to do good, but to prevent it from doing harm. In the acute form of the disease it can be of no use, and may be injurious. In the congestive acute form, Chisholm says, he found the exhibition of calomel to induce salivation of great benefit; but it must be remembered that he had previously taken from forty ounces to ten pounds of blood in order to equalize the circulation. It is in the chronic form of disease only that it is admissible, and even here it must be used with caution, and on certain conditions only. After suppura-



tion has commenced it will be of no avail, probably injurious, by augmenting local irritation. On the other hand, when the hepatic structure is much and extensively hardened by effusion of lymph, it cannot be expected to do good. It is only when the hepatic vascular system is passively gorged that mercury should be employed; for it may then, by acting partly on the intestinal secretions, partly on the minute vessels, empty those of the liver, and favour their contraction. Various are the modes of administering the remedy. Houlston of Liverpool, who appears to have early called the attention of the profession to its merits, directed it to be employed in friction, by rubbing half a drachm or a drachm of mercurial ointment every night, or every other evening, causing copious salivation. Pemberton recommends a scruple of the strong ointment to be rubbed on the side every night, until the mouth is slightly affected. Saunders, while he adopts exhibition by friction, thinks there is no advantage in rubbing it on the side, more than on any other convenient part, where the cuticle is fine, and the absorbents numerous. Sir G. Ballingall thinks the blue pill the most efficacious and convenient, either in simple hepatic disorder, or complicated with flux; as it may be taken in almost any state of the stomach, and especially by those whose rank or circumstances enable to take care of themselves, without interrupting their usual occupations. By others again, as Clark, Curtis, Curry, and Johnson, calomel is the form of the remedy recommended. It is given either alone, so as to affect the gums, or combined with antimonial powder, with opium, or with compound extract of colocynth, when it produces one or two copious stools daily, and appears slowly, but effectually to drain the surcharged vessels of the liver, and restore the natural secretion of the gland.

Since the commencement of the present century, another remedy has been added to the number of those said to cure hepatic disease, in the administration, internal and external, of the nitric or nitro-muriatic acid. The nitrous or the nitric acid is given in doses of from five to twenty minims in two or three fluid ounces of water three or four times daily. A convenient mode of administration is to mix a drachm of nitric acid with one pint or one pint and a-half of water, and cause the patient to drink this in the course of the day. As it is in danger of softening or corroding the teeth, the best method is

instantly to rinse the mouth with a solution of carbonate of soda or potass. The nitro-muriatic acid, prepared by combining one measure of nitric acid with two of muriatic acid, consists of nitrous acid and chlorine dissolved in the water of both acids. It may be given in doses of from five to fifteen or twenty drops in three or four fluid ounces of water, twice, three, or four times daily, attending to its effects, and the influence produced on the symptoms. The physiological effects of this agent are, much thirst, a peculiar taste in the mouth, and sometimes tenderness and abrasion of the mucous membrane of the gums and mouth,—results which the late Dr Duncan was wont to ascribe to the contact of the chlorine on the parts. The therapeutic effects are in general some improvement in the appetite, a greater degree of vigour, and gradual disappearance of the listlessness and languor often presented by hepatic patients. Its influence, however, in diminishing the size of an enlarged liver, or removing the uneasy sensations of an inflamed liver, has not been realized, and may justly be questioned.

As it is chiefly the chlorine which appears to be the active therapeutic agent in this method of medication, the chlorine water (*aqua chlorinii*), may be substituted in place of the nitro-muriatic acid. Of this from one to two drachms diluted in eight ounces of water, may be exhibited twice or three times daily till its characteristic physiological effects are produced.

The external employment of nitro-muriatic acid in the form of bath was very strongly recommended by Dr Scott of Bombay, as a remedy of great efficacy in chronic hepatic inflammation. At first this gentleman used in the preparation of his nitro-muriatic acid, three pints of nitrous acid with one of muriatic, to imitate that which he had made in India, and which was obtained from impure Bengal saltpetre, which contained sea-salt; but afterwards he employed the acids in equal weights, and added as much water in a wooden tub or bath as made it slightly acidulous, or like weak vinegar. Of this he judged by the taste alone. In a bath thus prepared he immersed either the whole body, or the legs and feet, or the lower extremities, for the space of from fifteen minutes to half an hour, and repeated the bath twice or even three times daily. In other circumstances, he merely sponged the skin with the acidulous water thus prepared, and found that fifteen or twenty

minutes sponging was followed by nearly the same results as immersion.

The physiological effects of this method of treatment are the following. When the bathing or sponging has been often repeated and continued long, a sense of weakness comes on occasionally, some restlessness and marks of nervous irritation are manifest, a metallic taste, usually compared to that of copper, is felt in the mouth, and soreness in some part of the mouth or palate, not permanent, but subsiding and recurring. At length little specks, like aphthous abrasions, affecting the mucous epidermis, are visible on the inner surface of the mouth, cheeks, and tongue, and cause some degree of rawness and tenderness; and, at the same time, the secretion of saliva is increased with increased sense of faintness and depression. The excoriation never goes deeper than the epidermis; it never gives rise to foetid ulceration; nor does it produce any offensive smell in the mouth or breath; and it is healed in a short time after the use of the bath is stopped. The flow of saliva varies much, being at one time considerable, at another wholly suspended. The teeth are at the same time the seat of some tenderness, but sustain no permanent uneasiness.

Besides these effects it is said to augment the secretion of the biliary fluid, and to increase the amount of cutaneous perspiration.

According to Dr Scott, the therapeutic effects are not less conspicuous in cases of *hepatitis*. Its use is followed in a short time in some cases, in others after a longer interval, with increase of vigour and strength, removal of the feelings of despondency, improvement in the colour of the skin, improvement in the digestive functions, and, in short, complete recovery from all the symptoms of the disorder.

No doubt can be entertained that all the effects now specified depend on the action of chlorine, and consequently chlorine water may be employed in the same manner, and with the same intentions as the nitro-muriatic acid bath.*

It must be observed, nevertheless, that the expectations created by the original accounts of the trials made by Dr Scott have not been realized in the practice of subsequent physicians. Nor is it easy to see how chlorine can exercise the effects ascribed to

* On the Internal and External Use of the Nitro-muriatic Acid, in the cure of Diseases. By H. Scott, M. D. Medico-Chirurgical Trans. Vol. viii. p. 173. London, 1817.

its use by Dr Scott on an inflamed liver, or any serious disorganization of the organ. There is strong reason to believe that this disappointment is to be ascribed to inaccurate diagnosis, and, above all, to the mistake often committed, of ascribing to hepatic inflammation the symptoms of general dyspeptic disorder, and mere gastro-hepatic derangement.

Lastly, one agent from which theoretical considerations would lead us to expect considerable benefit in chronic disorders of the liver is iodine. From the effect which that substance exercises on the glandular system, especially in reducing the natural size of several glands, it may be expected to be highly efficient in diminishing congestion and enlargement. With this view the iodurated hydriodate of potass may be given in solution according to the formula, in doses of from five to ten drops, three or four times daily, until the characteristic effects of the agent be produced.

The alkalies, as soda and potass, are also used with advantage, along with cathartics, in the chronic congestive state of the liver.

When the enlargement leads to the suspicion of an abscess, the method adopted by Dr Graves, of favouring the progress of the matter to the surface by means of an incision through the integuments, but not into the collection, appears the most expedient. (Dublin Hospital Reports, Vol. iv.)

§. VII. Inflammation of the Milt or Spleen. *Lienia, Splenia. Splenitis*, Sauv. gen. 114, Lin. 36, Vog. 59, Junck. 67, Sag. gen. 313. *Lienis inflammatio*, Boerh. 958, and Van Swieten. Comm. *Splenitis phlegmonodæa*, Sauv. sp. i. Forest, l. xx. v. vi. De Haen, apud Van Swieten, p. 958. *Pleuritis splenica*, Sauv. 19. *Splenalgia suppuratoria*, Sauv. sp. 3.

Baillie's Morbid Anatomy.—Pemberton on the Abdominal Viscera, Chap. v. p. 71.—On Painful Affections of the Side from Tumid Spleen. By Robert Bree, M. D., &c. Medico-Chir. Transact. Vol. ii. x. p. 85.—A Case of Splenitis, with further remarks on that Disease. By Robert Bree, M. D., &c. Medico-Chirurgic. Transact. Vol. iii. p. 153.—C. H. Schmidt, Commentatio de Pathologia Lienis. 4to. Goettingæ, 1816.—Heusinger Betrachtungen und Erfahrungen über die Entzündung und Vergrößerung der Milz. Eisenach, 1820.—Ad Acutæ et Chronicæ Splenitidis in Humilibus præsertim Italiæ locis considerata, eidemque succedentium morborum Historias, Animadversiones. Auctore Stanislao Grottanelli, Phil. Med. et Chir. Doctore. Florentiæ, 1821. 8vo. Pp. 199.—Clinical Illustrations of the most Important Diseases of Bengal, &c. By William Twining, M. R. C. S. Calcutta, 1832 and 1835.

THE spleen appears to be liable to four forms of inflammatory action; 1st, proper inflammation terminating in resolution

or suppuration; 2*d*, simple enlargement from vascular distension; 3*d*, enlargement with induration of its tissue; and 4*th*, softening of the spleen.

1*st*, *Acute Inflammation*.—This disease comes on sometimes with shivering or wandering sensations of chillness, sometimes without any indications of febrile disorder. In the left hypochondre pain is felt, fixed, deep-seated, sometimes acute, pungent, burning, or throbbing, more frequently dull, heavy, yet aggravated by pressure, coughing, deep inspiration, and extending to the shoulder, breast, or clavicle of the same side. In general pain is either produced or aggravated by lying on the left side; but sometimes it is worst on the right. In some cases dyspeptic symptoms, as squeamishness, vomiting, flatulence, and acrid eructations take place; in other instances bilious or bloody vomiting, with hiccup, anxiety, and dyspnoea are observed.

In two cases of inflamed spleen examined by Dr William Hunter, where the inflammation had advanced to suppuration, the patients could not define accurately the seat of the pain, which seemed to travel over the general cavity of the abdomen. In another case, in which Anthony de Haen found the spleen distended with a large quantity of thick white purulent matter, the symptoms had, during the inflammatory stage, been ascribed to pleurisy.

Both Schmidt, Heusinger, and Grottanelli record, in like manner, instances in which suppuration had taken place in the spleen without the production of any manifest symptom or local uneasiness, sufficient to lead the circumstance to be suspected except general bad health and wasting. A remarkable case of this kind is recorded by Dr Abercrombie, in which the patient, after slight catarrhal symptoms, pined away without distinct local uneasiness for six months, and died wasted and weakened, latterly with diarrhoea of two days standing, and upon inspection the spleen contained several ounces of purulent matter. Similar instances of purulent collections in the spleen, where no indication of previous disorder was afforded, have come under my notice in the course of inspecting bodies at the Royal Infirmary.

These facts show clearly that suppuration of the spleen may take place without being attended with evident or urgent external symptoms. In this case it may become a question whether the suppuration is the effect of acute inflammation, or rather of a pe-

culiar chronic suppurative action,—connected probably with that convenient and ill-defined abstraction, the strumous diathesis. It must not be imagined, nevertheless, that no symptoms are produced by this disorder. There are always wasting or pining, considerable weakness, sometimes a pale or sallow unhealthy look, sometimes slight dyspeptic symptoms, and sometimes, though more rarely, a sense of uneasy fulness deep in the left hypochondriac region. The most perplexing part of the semiography and symptomatology is this, that these purulent collections cause almost no uneasy feelings, till by their size they induce distension or painful stretching of the organ, or pressure or tension of some of the surrounding parts.

In such circumstances, it is chiefly by negative signs that the practitioner can infer the existence of disease, in the shape of inflammation or abscess of the spleen; and if he meets with a case in which the patient pines away without cough, expectoration, cavernous respiration in the chest, or the signs of empyema in the side, or indications of enlarged liver, or ulceration of the intestinal mucous membrane, he may then infer the probable existence of suppurative or other disorder of the spleen.

This disease is rare, and therefore not well known; but the practitioner must not expect, like Pemberton, never to meet with it. Abscess of the spleen is sometimes found to be the only morbid appearance in sundry cases of long ill health, with wasting and hectic fever.

2. *Simple or indolent enlargement from vascular distension.*—Almost all authors have noticed enlargement of the spleen, supervening either spontaneously or after ague and other bad fevers. Morgagni relates an instance in which the spleen of a slender woman of twenty-eight, who had undergone chronic fever, occupied the whole of the left side of the belly, and weighed eight pounds and a-half, without change of its interior structure, but apparent dilatation of the vessels and development of its lymphatics; Pemberton mentions one weighing three pounds two ounces, yet with perfectly natural structure; Mr Elliot describes one weighing eleven pounds thirteen ounces, with natural structure;* and Bree states it to vary from one to twenty or thirty pounds after ague and chronic diseases of the viscera. Its natural weight is from nine to fourteen ounces. Baillie remarks, that this simple enlargement with structure

* Med. Com. Vol. xvii. p. 497. Stoll, Ratio Med. i. 163, 251.

perfectly healthy, happens to the spleen more commonly than to any other organ, and regards it rather as a monstrous growth than as actual disease. It appears to me that this is correct only to a certain extent; and that simple enlargement is an incipient morbid state, which will progressively terminate in another morbid state, which is distinguished by less equivocal organic characters. Pemberton formed a just notion of this enlargement or swelling of the splenic substance, when he said it might perhaps arise from a larger quantity of blood being conveyed to it by the arteries, without, however, these arteries taking on that action, which is the essence of inflammation. In short, whatever be the remote cause or the material agent, the disease consists in unusual accumulation of blood in the organ, whether conveyed by arteries or not removed by veins; and if this accumulation continues long, it will, under certain circumstances, render the organ unusually soft. When the capsule, which in such circumstances is very tender, is broken, the substance of the spleen seems to consist of little else than a very soft brownish red mucus, intermixed with a spongy fibrous texture. This softening, as it may be named, appears to be caused by the immense quantity of blood in the vessels, producing a slow but severe disorganization or breaking down of the proper splenic tissue. (See Dr Bree's paper.) Baillie thinks it is hardly to be considered as a disease; but this opinion, I fear, rests on no good foundation. In some circumstances, to be afterwards specified, the structure of the spleen not enlarged is unusually soft, apparently from some cadaveric change; but the true softening of the enlarged organ is effected in the manner now represented.*

The symptoms of simply enlarged spleen are not well known. The patient usually complains of a sense of fulness rather than pain in the left side; in some instances pain is felt when the left side is examined or pressed; in others the pain is not perceived in the seat of the spleen, but at the lower part of the left side, inclining towards the back (Morgagni, lxx. 10); and in others, the swelling may proceed to a very large size without causing any uneasiness whatever. In most cases the left hypochondriac region bulges out, and in some the enlargement may be distinctly felt by the hand. The patient can only lie on the left side; the countenance is sallow, but not jaundiced; hemorrhages from the nose take place; and if it continues long, it may cause watery effusion within the peritoneum, (*ascites*.)

* See note on Cooke's Morgagni, Vol. ii. p. 176. The spleen, a mass of gorg.

Indolent enlargement of the spleen may terminate in resolution, by subsiding spontaneously or under medical treatment, in softening with emaciation or death, or in induration and incurable dropsy of the belly.

The causes of indolent enlargement are little known. A long continuance of intermittent fevers, especially quartans, gives the spleen a tendency to swell, and the disease is common in fenny or aguish districts, both in this island and on the Continent. Thus in Lincolnshire, Essex, Kent, Cambridgeshire, &c. it is not uncommon; it assumes its most formidable appearance in the departments of the lower maritime Alps in France; in Hungary it is endemial; and in the Carolinas and other southern states of the American Union, it is rare to find persons who have attained thirty or five and thirty years, without more or less enlargement of the spleen. In some instances the disease succeeds a blow on the hypochondre.

3. *Indurated enlargement of the Spleen.*—This is perhaps more common than enlargement with softening; for every enlarged spleen may in process of time become hardened. In this state the organ may be five or six times its natural size, yet when divided presenting its natural structure, only much more dense and compact than natural. This is sometimes considered as scirrhus, but it is unlike to this in other parts of the body, and its real nature is not well understood. It is not improbable that it is the effect of chronic inflammation. It is generally attended with dropsical effusion within the peritoneum. It can seldom be recognized till the disease has made such progress that the enlarged organ is felt externally, when it protrudes the false ribs, and the anterior edge or top of the organ can be felt by the hand applied to the belly under the margin of the ribs. It is sometimes notched. Even in this state the only symptoms are an unhealthy sallow look, wasting of the fleshy parts, and swelling of the belly, dry skin, and at length the usual signs of dropsy of the belly.

The disease is a common effect of residence in aguish districts. According to Grottanelli, it is endemial in the Pitiglian territory and other low districts in Italy.

It is not perfectly ascertained whether this form of simple enlargement of the spleen, or the enlargement with induration ever proceeds to suppuration. M. Raikem of Volterra records in a young book-keeper, of 21, a case of *splenitis* ending in an extensive collection of fetid purulent matter, in which, from the progress of the symptoms, there is reason to believe that the

organ had been affected at first with simple enlargement from vascular distension. The whole duration of the disease appears to have been rather more than three months; that of the acute symptoms, for which the patient was under the care of M. Raikem, two months; and the tumour of the left hypochondre, which was at first hard and resisting, and extended to the *linea alba* and navel, became about the sixth week soft, increasing in size, and afterwards diminishing remarkably. (Breschet, *Repertoire General d'Anatomie et de Physiologie*, Tome vii. p. 115.)

4. *Softening of the Spleen*.—It is requisite further to notice here, another form of disease of the spleen which, if not inflammatory in origin, is still most generally found to take place in circumstances in which the organ is subjected to great vascular distension. This is the pulpy softening of the spleen. The organ may be softened in various degrees from that degree of softness which allows the finger to sink in it to the consistence of a fluid pulp like thick wine lees. It is not known what is the cause of this destruction or pulpy disorganization. It is observed very frequently in fatal cases of continued fever, (*synochus* and *typhus*,) and occasionally in ague and remittent fever. It does not appear to be a cadaveric effect; since the degree, which it presents, bears no proportion to the interval elapsing between death and inspection in the different cases inspected. If it were permitted to offer any conjecture, it may be said that it is occasioned by the excessive distension of the blood-vessels in an organ, the texture of which is feeble and delicate.

THERAPEUTICS.—The treatment of acute splenic inflammation is the same as that of the liver. The indolent enlargement commonly subsides spontaneously, though its disappearance will be hastened by mild diet, the use of purgatives, and mercurial friction on the belly. If there be tenderness or soreness in the hypochondre, blood may be abstracted by cupping or leeches. Small doses of calomel, with extract of hemlock, answer the purpose of allaying irritation of the stomach and promoting absorption. When the mouth is slightly affected it may be relinquished. Milk, gruel, and a small quantity of animal broth should be the diet of the patient. Chalybeates are believed to be specific.

In the chronic or indolent form of the disorder, which accompanies or succeeds symptoms of ague, Grottanelli speaks with the greatest confidence of the beneficial effects of percussion on the left hypochondriac region by means of a small hatchet. This measure was originally introduced into practice in

Naples, and especially in the Neapolitan Hospital by Doctor Pasquale Vetere in the year 1792, and it appears to have been employed with great perseverance and considerable success by various Italian practitioners. It appears to act on the principle of derivation or counter-irritation.* The seton, issue, moxa, or caustic potass or actual cautery, may be used with the same view.

§. VIII. Inflammation of the Sweetbread or Pancreas.

Pancreatit, Pancreatitis.

Wedekind, Aufsätze uber verschiedene Gegenstände der Arzneywissenschaft. Leipzig, 1791.—Diagnosis Scirrhorum Pancreatis Observationibus Anatomicis-Pathologicis illustrata quam pro Dissertatione Inaugurali Gottingæ defendebat, anno 1796, Joannes Rudolphus Rhan, Medico, Helvetico : Turicensi. Apud Brera, Sylloges, Tom. ii. p. 99.—De Conditionibus Pancreatis Materialibus. Auctore Joanne Christiano Wecker, Medico Ucaro-Marchico. Apud Brera Sylloges, Tom. vii. Ticini, 1807.—Hoffmann de Pancreate ejusque morbis cum casu annexo Pancreatis Morbo in ingentem degenerati molem. Altdorf, 1807. 8vo.—Harles uber die Krankheiten des Pancreas. Nurnberg, 1812.—Remarks on Tumours which have occasionally been mistaken for Diseases of the Liver. By J. Latham, M. D. F. R. S., &c. Read 11th Dec. 1806. Medical Trans. Vol. iv. p. 47. London, 1813.—History of a Remarkable Case of Enlargement of the Biliary Ducts. By Charles H. Todd, M. R. C. S. Dublin Hospital Reports and Communications, Vol. i. p. 325. Dublin, 1817.—Two Cases of Inflammation and Enlargement of the Pancreas. By Edward Percival, M. B. M. R. I. A., Bath. Read 1st June 1818. Transactions of the Association of the Fellows and Licentiates of King and Queen College of Physicians in Ireland, Vol. ii. p. 128. Dublin, 1818.—A Practical Treatise on Various Diseases of the Abdominal Viscera. By Christ. Robert Pemberton, M. D., &c. London, 1807; and 4th Edit. 1820, Chapter iv. p. 63.—Observations, Pathological and Therapeutic, on Diseases of the Pancreas. By J. J. Bigsby, M. D., in Edinburgh Medical and Surgical Journal, Vol. xlv. p. 85. Edinburgh, 1835.

THAT the pancreas is liable to inflammation has been admitted by most morbid anatomists; but it has been also ascertained, that it is very difficult if not impracticable, to recognize the inflamed state of the gland by symptoms during life. Morgagni believed that he found it twice in a state of inflammation, that is, redder and more vascular than usual; and Wedekind and Daniel have since his time mentioned the circumstance as taking place occasionally. Portal states in general terms that, when inflamed, it is redder than natural not only at its external surface, but in its interior substance; and that it had been found in this state in persons who had undergone an attack of continued fever of more or less intensity, with pains in the abdomen, especially at the navel, frequent fits of violent vomiting, in some

* Saggio sopra un nuovo e sicuro metodo di curare le ostruzioni. Napoli, 1792, del Dott. Pasquale Vetere.

instances jaundice, and diminished secretion of urine. Baillie was led by experience to regard inflammation as not very liable to attack the pancreas.

The only inference that can be deduced from these several facts, is, that inflammatory action, if it do take place in the pancreas, does not in all cases evince its presence by well-marked or unequivocal symptoms.

Two proofs, however, of the presence of inflammation in this gland may be adduced. The one is suppuration or abscess of the gland, sometimes with, more frequently without, pain and other external symptoms; the other is different degrees of induration of the gland, usually with pain in the epigastric region, and occasional vomiting.

I. *Purulent Inflammation of the Pancreas.*—Collections of purulent matter in the pancreas have been observed by many anatomists. Tulpus mentions the case of a young man who, after an intermittent fever, was attacked with pain in the belly and loins, so violent, that he was unable to lie on any side. After death, besides inflammation of the liver, the pancreas was found suppurated.* Thomas Bartholin found, in a man who had previously fever with pains in the back and in the loins, the pancreas altogether destroyed by an enormous abscess, full of foetid greenish matter;† Blancard records a similar history;‡ and Lieutaud mentions instances which had occurred to various observers.§ Bonz describes in a man of thirty-eight, an abscess in the right extremity of the pancreas, the purulent matter of which implicated the stomach and the liver, and established a communication between the liver and the abdomen.|| Gautier states that, in the body of a woman who had been afflicted with long-continued *cardialgia*, he saw an abscess of the pancreas which opened into the posterior wall of the stomach.¶ Portal states that he found the pancreas in a state of complete suppuration in a person who, after having experienced violent paroxysms of gout in the feet, upon their disappearance, had two or three fits of vomiting, followed by syncope and death.** Baillie informs us that

* Obs. Med. Lib. iv. cap. xxxiii. p. 327. Amst. 1652 and 1672.

† Centuria ii. Hist. xxxix. Tom. i. p. 333. Hafniæ, 1654–1657.

‡ Anatom. Pract. Cent. ii. Obs. lv. p. 271.

§ Hist. Anatom. Med. Tom. i. Obs. 1046 and 1060.

|| Nov. Acta. N. C. T. viii. p. 51.

¶ J. L. Gautier de Irritabilitatis Notione Natura et Morbis. Halæ, 1793, §. 13, p. 129.

** Anatomie Medicale, Tom. v. p. 352. Paris, 1803.

he only once met with an abscess in the pancreas in the case of a young man of little beyond the age of twenty, and in whom the gland was enlarged in size, and contained a good deal of thin purulent fluid without peculiar characters, unattended by fixed pain in the region of the gland, but with a good deal of pain in different parts of the belly.*

In cases of this nature the suppuration may be either limited and partial, or extensive and destroying the greater part or the whole of the gland. The matter is usually of a gray-white colour, similar to that of other abscesses; in a few cases it is greenish. It may be either inodorous or exhale a faint mawkish odour like ordinary matter; and it has in a few instances been found extremely fetid. In some cases it consists of thin serous fluid with curdly clots; and it is then conceived to indicate the presence of the strumous diathesis.

The matter of these pancreatic abscesses is often enclosed within a sac or membranous pouch, formed by the cellular tissue either of the pancreas or covering the gland. Portal states that he has seen two pounds of purulent matter contained within the gland. It may open a passage to itself either through the posterior wall of the stomach, through part of the *duodenum*, through the colon into its cavity, or into the general cavity of the *peritonæum*.

Portal allows that suppuration is in many cases the immediate effect of inflammation of the pancreas. It may be admitted that, in all cases where suppuration has taken place, it is the effect of inflammation; and the only circumstance of difference is the question, whether the inflammation is attended with pain and other feelings of uneasiness, or is unattended by these symptoms? Suppuration seems always to be a process occupying a considerable time; and in this point of view it may be said to be chronic. But it appears from the cases recorded, that suppuration or suppurative inflammation is of three kinds, at least; the ordinary, the strumous, and the metastatic. In the two former instances it must be admitted to be preceded by inflammatory action, however obscure that may be, and however indistinct be the symptoms to which the process gives rise.

It is chiefly important to observe that inflammatory suppuration of the pancreas does not at first give rise to well marked symptoms. But after some time, that is, when probably the pu-

* Morbid Anatomy in Works by Wardrop, Vol. ii. p. 238 and 240. London, 1825.

purulent collection has become considerable, and begun by mechanical pressure and distension to affect the physiological properties of the gland and the contiguous parts, fits of vomiting, more or less violent and continued, especially after taking food, take place; pains of the loins, which have been often mistaken for nephritic or rheumatic pains, and which prevent the patient from lying on his back, ensue; sometimes pains of the belly, like spasmodic pains (Baillie), are observed; after sometime the pulse, which at first was unaffected, becomes a little quick, from 80 to 86; dyspeptic symptoms, as flatulence, *cardialgia*, and *gastrodynia*, are observed, in some instances with occasional diarrhoea; the patient appears to derive no nutriment from his food; and he dies tabid.

The name of *metastatic suppurative* inflammation, I have employed to denote suppuration of the pancreas occurring under peculiar circumstances. It was long ago observed, that in the operation of extirpation of a testicle or testicles, and subsequent ligature of the cord to prevent hemorrhage, among other accidents it occasionally happened, that a collection of matter was formed within the substance of the pancreas or around the gland; and the same result was observed to take place in the course of various diseases of the testicle or its vessels. Antony Petit especially, who had witnessed several examples of the suppurative destruction of the pancreas, adduces them as arguments against the propriety of practising the operation of ligature of the cord after castration. Portal also informs us that he found in a man dead after extirpation of a testicle and ligature of the spermatic cord, a large quantity of purulent matter within the cord, and round the pancreas.

The explanation of this singular occurrence is to be found in the fact, that, in the old method of inclosing the cord within a ligature, the veins were included, and very often became inflamed and underwent the suppurative inflammation. When this took place, the matter formed in the interior of the spermatic veins was transported to various internal organs, sometimes to the kidneys or their vessels, sometimes to the lungs, and sometimes to the pancreas, and there deposited. According to this view, it is scarcely requisite to regard inflammation as the necessary preliminary of this suppurative deposit, and probably the purulent matter found around or within the pancreas is to be considered as transported from the inflamed part

of the tied vein to the other parts of the venous system, and among others to the pancreas.

Suppuration of the pancreas has been observed in persons dead of ague, continued fever, fever after the suppression of some habitual evacuation, diarrhœa, hemorrhoids, the *catamenia*, dropsy, marasmus, convulsions, epilepsy, and hysteria. Regarding the four latter conditions it is proper to observe, that the state called marasmus is undoubtedly the tabid condition with hectic already noticed, as consequent on the purulent collection within the pancreas; and convulsive symptoms are so often observed to ensue on any of the disorganized states of the thoracic or abdominal viscera, that they are doubtless to be regarded as symptoms rather than preliminary conditions.

2. Adhesion of the pancreas to the adjoining organs may be the effect either of suppurative or common inflammation. In general, when suppurative inflammation takes place, more or less albuminous deposition is formed, and connects the gland to the adjoining organs either to prevent the farther progress of the destructive effects of the suppuration, or to prevent the purulent matter from being absorbed by the veins, and transported into the circulating system.

3. *Scleroma or Indurating Inflammation of the Pancreas; Scirrhus of Rahn and many other authors, improperly.*—The pancreas appears to be subject to slow chronic inflammation, which, without tending to suppuration, renders the gland much harder than natural, without, it is said, otherwise changing its structure. All that is meant by this, I presume, is, that the structure is not sensibly changed; for if minutely examined and compared with the sound pancreas, it will be found to be considerably altered. This chronic inflammation, though mistaken for scirrhus, and as such described by Morgagni, Haller, Tissot, Storcke, Baader, Rahn, Portal, and others, is quite distinct from it, in so far as it does not present the true scirrhocarcinomatous transformation. It appears to be the same change which has been described by Pemberton under the vague name of Disease of the Pancreas.

Instances of preternatural hardness of the pancreas have been noticed by Riolan, Charles Le Poix, De Paw, Harder, Morgagni, Haller, Tissot, Baader, and Rahn; but all have confounded, under the general name of scirrhus, a change which was evidently the effect of inflammation, probably of a chronic

character, acting on the glandular tissue. The observations of these authors appear to have been totally overlooked, at least by English physicians. Dr Latham, however, had the merit of directing the attention of the profession in 1806 to the symptoms of the disorder, as distinct from disease of the liver and other abdominal organs. Mr Todd also described in 1817 an instance of induration and enlargement, or what would now be called hypertrophy of the pancreas pressing the common gall-duct; and Dr Percival and Dr Frampton recorded examples of the disorder attended with unusual compression of the same duct and the symptoms of jaundice.

From only one dissection recorded by Dr Crampton it may be inferred, that inflammation attacking the pancreas renders that gland harder and larger, or more tumid than usual, and that, either in consequence of this tumefaction, it compresses and obstructs the common gall-duct, or the inflammatory action extending to the surrounding parts produces a morbid effusion, which gives rise to the same result.

It is unfortunate that Rahn, who has given the fullest collection of cases of induration of the pancreas, has not distinguished the disorder from scirrhus, properly so named, and has even given, as instances of the latter, cases in which tumours, more or less extensive, were formed from the mesenteric and meso-colic glands, and had then implicated the pancreas. It hence results, that it is impossible to attach to his history of symptoms that importance which a correct critical semiographical account deserves. It is important to know, however, that he mentions the following as present in most of the cases.

1. Pains between the ensiform cartilage and navel, at one time occupying the middle region of the belly and stretching to the spine, and at another the right or left hypochondriac region.
2. Tumour in the same region, easily palpable by the finger, hard, movable, causing a sense of weight while the patient stands or walks, most painful above the lumbar vertebræ, with great precordial anxiety, especially after taking food or drink.
3. A sense of burning in the stomach, not temporary but constant, with a painful sense of soreness and heartburn, spreading into the œsophagus, with frequent eructation of a watery, tasteless, or acid fluid which resembles saliva.
4. Constipation.
5. *Anorexia*, squeamishness; and, 6. Eventually vomiting occurring at uncertain intervals, bringing up *ingesta* and

ropy phlegm; and at length, 7. wasting (*tabes*), and hectic fever, with all their attendant symptoms.

The chief objections to this history are, that the same series of symptoms is liable to take place in various disorders of the stomach, the duodenum, and the liver; that the pancreas is sometimes found indurated without any of these symptoms having taking place excepting the pain and occasional vomiting; and that the circumstance of palpable tumour is often wanting, and when present is not pathognomonic.

The principal symptoms, judging from the cases recorded by Dr Percival and Dr Frampton, are deep-seated pain in the region of the stomach, more or less sickness, sometimes vomiting, with emaciation, general languor, fever, especially in the night, and in general a yellow or jaundiced colour of the skin. The urine is in general scanty and high-coloured; and though the bowels are generally confined, and dyspeptic symptoms are common, sometimes diarrhoea takes place, and proceeds to a considerable degree, apparently with salutary effect. Wedekind, who observed this symptom, absurdly ascribed it to a milder degree of pancreatic inflammation, or, as Gautier expresses it, to increased irritability of the pancreas. It may, however, be regarded as a law of inflammation of glandular tissue, that, in the early stage, the secretion is diminished or suppressed, and that, if it seem to be augmented in the latter stage, this is rather the effect and the proof of the subsidence of the inflammation and its final disappearance.

Only one case of this disorder, in which I had an opportunity of inspecting the parts after death, has fallen under my observation. The patient, a female of about 48, continued ill for seven or eight years with pain in the epigastric region, and suffered more urgently for about two years, with pain and tenderness in the same part, frequent attacks of sickness and vomiting, occasional diarrhoea, constant headach, a pulse varying from 88 to 96, most usually at 92, rather full, and hot dry skin, though pale, blanched, and at length leucophlegmatic complexion. The pain, which was most felt in the epigastric, and towards the right hypochondriac region, was so urgent, that the slightest and gentlest pressure could not be borne; it was constant, and underwent no remission; was distinctly referred to the region specified by the patient herself; and was always relieved by local bleeding, and occasionally by general blood-letting. The effect

of opiates was immediate but temporary, that of counter-irritation by blister or tartar emetic ointment more permanent. As the disease proceeded, the fits of vomiting became more frequent and urgent, and were accompanied with distressing hiccup; nothing was retained; the patient wasted, and became waxy coloured and leucophlegmatic; and life was maintained for some time by nutritious enemata with opiates. Though the emaciation was not visibly extreme, yet the pale waxy appearance of the surface and transparency of the skin, showed the imperfect and scanty degree of nutrition. Death took place apparently by exhaustion and inanition.

It was then found that the pancreas was exceedingly hard, almost like stone, a little enlarged, but not positively altered in structure. It resisted the knife like firm cheese or cartilage. The *acini*, which were the parts mostly altered, were of a reddish gray colour, very close in texture, and extremely firm. It seemed rather less vascular than usual. This body was felt during life, and it never could be pressed or handled without causing much pain. The gall-bladder was greatly distended,—a circumstance which showed that the pancreatic induration has compressed the common biliary duct.

In general, when wasting is far advanced, the gland may be felt more or less distinctly by slight pressure on the belly, which is also attended either with pain or tenderness. Induration of the pancreas is attended, after some continuance, either with a leucophlegmatic appearance and anasarca, or with dropsy of the belly, which, though not an invariable consequence, may supervene; and in every case of *ascites*, in which the liver does not appear to be indurated or enlarged, or the kidneys are known to be diseased, it may be apprehended that the pancreas is indurated and compressing some of the veins, either the *vena cava* or some of its branches.

In some individuals induration of the pancreas appears to give rise to that anomalous assemblage of symptoms called *hypochondriasis*; and this the practitioner, when consulted for hypochondriacal or dyspeptic symptoms, should always bear in remembrance. It is most probably in this manner that we are to explain the fact mentioned by Baillie, that in one instance there were pain in the hips and a sense of numbness in one thigh or leg. Difficulty and pain in stooping are also not unfrequent symptoms. It must not be omitted that this disease

is sometimes one of the lesions found in the bodies of the insane.

These statements are, it must be admitted, not satisfactory; and their chief use is to show the extreme difficulty of recognizing the presence of this disease during life, at a period sufficiently early to enable us to employ remedial measures with the hope of success. This difficulty led Pemberton to conclude, that it is chiefly by negative reasoning that the physician must infer the existence of disease of the pancreas; that is, if in a case in which there is deep-seated pain in the epigastric region, and more or less sickness and emaciation, the patient does not at the same time present the other symptoms, denoting the presence of primary disease of the stomach, of the posterior part of the liver, of the gall-bladder or ducts, or of the small intestines, he may infer the evidence of disease, that is, chronic inflammation of the pancreas.

4. *Hypertrophy*.—Enlargement of the pancreas is an effect either of chronic inflammation or of innutrition, is often associated with induration; but may take place with a natural state of the consistence of the gland. When the gland does become enlarged in this manner, it is almost superfluous to say that the lesion causes more or less of a firm, solid, tumid mass in the epigastric region. The bulk which the hypertrophied gland attains varies in different circumstances, chiefly according to the duration of the disorder. Riolan mentions a case in which it was as large as the liver, (*Riolani Anthropographia*); in a person mentioned by Tissot, its size was three times the natural size, (*De Melæna et Morbo Nigro*); and in a woman seen by Storck, it is said to have been so large as to weigh thirteen pounds. In the case of a woman of forty years, detailed by Rahn, the gland measured nine inches long and seven broad, and weighed a little above four pounds, and its internal structure was like lard. Westenberg describes a case in which the gland weighed six pounds. The natural weight varies from one ounce and a half to six ounces.

In some instances the hypertrophy is only partial, and it then affects chiefly the right side of the pancreas, which may attain the size of the fist, while the left side is natural. (Rahn, cases 4th, 5th, 6th, 11th, 12th.) A common result, then, is pressure upon and obstruction of the common biliary duct, and consequent distension of the gall-bladder, and, if the obstruction be complete, a jaundiced colour of the surface.

This enlargement appears to be quite of the same nature as that which is observed to affect other secreting glands, as the mamma, the testicle, and the liver. In general the individual lobules and *acini* may be observed to be perceptibly enlarged; and I am disposed to regard the case mentioned by De Haen, (*Opuscula*, P. I. p. 217-248,) in which he represents the gland to have degenerated into numerous scirrhus tumours of various size, closely cohering to each other, as of this kind. When it resembles lard or suet, I suspect the disease to be of the kind named *Encephaloma*, and, therefore, is not referable to the present head.

5. *Emollitio* ; *Malacosis*.—Softening is also observed on certain rare occasions to take place in the pancreas, and, if attended with increase of size, may be regarded as the effect of inflammation. In other instances, for example, in persons labouring under scurvy, in cachectic persons, and in several eruptive complaints, it seems doubtful whether the diminished consistence can be ascribed to inflammatory action. Portal informs us that he found it much softened without being reddened or swollen, in two children cut off by measles, and also in the body of a young man between fifteen and eighteen years, who died on the tenth day of confluent small-pox.

When the tissue is reduced to a soft greenish-coloured foetid pulpy mass, it is believed to constitute gangrene of the pancreas, a very rare affection. A case is mentioned by Portal, (*Tome v. p. 354*).

6. *Atrophy* of the pancreas, or diminution of its size, sometimes with, sometimes without, condensation and induration of its substance, may be regarded as one of the effects of enlargement of some of the other abdominal viscera, for instance the liver, the spleen, or the right kidney. It is also in general diminished in size in chronic inflammation and ulceration of the intestines. It is not so much an effect of inflammation, as of the opposite state of diminished supply of blood for nutrition. By some, however, it is regarded as a remote effect of inflammation.

ETIOLOGY.—The causes of inflammation of the pancreas, whether terminating in suppuration or in induration, are almost entirely unknown. Rahn, who distinguishes them into predisposing and remote, makes the former to be a pituitous strumous diathesis, or that state which is believed to dispose to glandular enlargement and obstruction in general, and, distinguishing the latter into exciting and occasional, refers to the first head indi-

gestible viscid food, the abuse of spirituous liquors, gloomy mental affections, and metastasis, and to the latter all those causes which may derange or pervert the abdominal circulation; *e. g.* derangements and irregularities in the menstrual secretion, or the hemorrhoidal discharge, long protracted spasms in hypochondriacal and hysterical subjects, colic pains, and intermittent fevers imperfectly cured. Among other causes are mentioned carrying heavy loads on the back, tightness of the clothing, especially if it act like a tight ligature, the excessive use of ices, the frequent use of emetics, a sedentary life, and disease of the adjoining organs. Hildenbrand is disposed to impute to the excessive use of mercury, given especially in large doses, inflammatory congestion of the pancreas; and he is led to ascribe considerable etiological influence to another cause, *viz.* the use of tobacco, especially if accompanied with much spitting, from the fact of a friend who indulged much in smoking the fragrant herb, and spit copiously, having died, and because upon inspection of the body, the pancreas was found increased in size and indurated. (III. §. 800.)

DIAGNOSIS.—This disorder is to be distinguished from enlargement and induration of the liver, scirrhus or cancerous thickening of the pylorus, enlargement of the spleen, enlargement of the mesenteric or mesocolic glands, chronic inflammation of the *peritonæum*, chronic inflammation of the *duodenum* or colon, and encephaloid tumours developed either in the liver or the pancreas or on the peritonæum. It should also be distinguished from true scirrhus of the pancreas, though this is a very difficult task. On this point, the observations of Dr Bright (*Medico-Chirurg. Trans.* Vol. xviii. p. 1,) should be consulted.

THERAPEUTICS.—The remedies for the abatement or removal of disease of the pancreas are as imperfectly known as the symptoms and the causes of the disorder. The principal circumstances to be urged in treatment is the abatement of pain and other marks of inflammation by means of local depletion, and great attention to the state of the stomach and bowels. The severity of the pain in the epigastric region is always mitigated by the bleeding from the application of leeches; and occasionally it is requisite to take a blood-letting from the arm.

The efforts to vomit must be restrained by the use of opiates, effervescing draughts, and Seidlitz powders or soda water; and the bowels should be emptied once every twenty-four hours; and this is best done by *enemata*. Kreosote I tried, but found not

more effectual in restraining vomiting than the thebaic pill, or effervescing draughts with solution of muriate of morphia.

In some instances it is proper to have recourse to revellent or counter-irritant means, as blistering the skin or rubbing the tartar-emetic ointment over it, until pustules are produced. When the patient is very feeble, a convenient but very ineffectual application, is an opiate or belladonna plaster placed over the epigastrium.

The patient should adhere strictly to milk, grain, roots, and mucilaginous fruits, and abstain from all fermented or spirituous liquors. If pure milk, when taken in very small quantities, disagree, it should be diluted with water, or the patient may confine himself at first to whey for some weeks, and afterwards pass to asses milk, and at length to cows' milk, which should be continued till the symptoms give way.

Lastly, It is of great moment in the treatment of this disorder to prevent fermentation of the food and the formation of gas, so as to distend the stomach or duodenum, all of which greatly aggravate the sufferings of the patient. The most effectual remedy for this indication is the frequent use of carbonate or bicarbonate of soda, in doses of four or five grains, three or four times daily, or *aqua potassæ* in doses of fifteen minims three or four times daily.

§. IX. Inflammation of the Kidney. *Nephria, Nephritis.* *Nephrite.*

Troja über die Krankheiten der Nieren der Harnblase, &c. Leipzig, 1788. Espenmüller, Dissertatio de Nephritide. Giessæ, 1790.—F. A. Walter, Einige Krankheiten der Nieren. Berlin, 1800. 4to, pp. 46.—Hencke, Dissert. de Nephritide. Halæ, 1806.—Pourcelot, Considerations sur la Nephrite. Paris, 1806.—A Practical Treatise on Various Diseases of the Abdominal Viscera. By Christopher Robert Pemberton, M.D. F.R.S. &c. London, 1807. Fourth edition. London, 1820. Chapter vi. p. 77.—Practical Observations on the Diseases of the Urinary Organs. Illustrated by Cases and Engravings. By John Howship, M.R.C.S. London, 1816. Chapter i. and ii.—A Practical Treatise on the Symptoms, Causes, Discrimination, and Treatment in some of the most important Complaints that affect the Secretion and Excretion of the Urine, &c. By John Howship, Member of the R. C. Surg. Lond. London, 1823. Section ii. p. 8.—Observations pour servir à l'histoire des maladies des Reins; par Dance. Archives Generales, Tom. xxix. p. 149. Juin 1832.—On Irritation of the Spinal Chord, and its Nerves in connection with Disease in the Kidneys. By Edward Stanley, F. R. S., &c. Medico-Chirurg. Trans. Vol. xviii. p. 260. London, 1833.—Recherches sur la Nephrite ou Inflammation des Reins; par M. le Professeur Chomel. Archives Generales, T. xliii. p. 1 et 477. Janvier et Avril 1837.

THOUGH inflammation of the kidney or kidneys is a disease which has been noticed by all systematic and practical authors, yet it is doubtful whether it has not been described rather upon

speculative grounds than from the phenomena presented by actual cases of the disorder. Pain, in general very acute, in the region of the kidney, often following the course of the ureter, and not aggravated by bending the trunk ; frequent micturition of urine, which is either thin and colourless or very red ; sometimes total suppression of the secretion ; vomiting ; more or less numbness of the thigh ; retraction or pain of the testicle of the affected side, with symptoms of inflammatory fever, (*synocha* ;) are the usual phenomena which have been said by the majority of systematic authors to distinguish the presence of renal inflammation.

The acute form of the disorder, the presence of which is understood to be indicated by the symptoms now specified, has been usually distinguished into two varieties, according to the supposed nature of the exciting cause ; the idiopathic, or that originating spontaneously, and without the presence of any cause of mechanical irritation ; and the symptomatic, or that which is induced more or less immediately by the irritation of one or more urinary concretions or sandy particles in the pelvis, or in any of the *infundibulu* of the gland. The first variety is supposed to be rare ; the second greatly more common.

A person about to be attacked with renal inflammation in the acute form is generally seized with shivering, languor, and debility, which are speedily followed by pain in the dorso-lumbar region, near the last dorsal or first lumbar vertebra, about three inches distant from the spine, higher it is said when the left kidney, deeper when the right is attacked, stretching from the last false ribs to the crest of the ilium, sometimes along the course of the ureter to the bladder, or by the spermatic vessels to the testicles. By handling roughly, coughing, deep inspiration, walking, and even in some cases lying on the back, the sufferings of the patient are aggravated, whence he is compelled either to lie on the sound side, or on the belly, if both kidneys be affected. In mild attacks the patient can rest on the affected side.

The function of the kidney is uniformly more or less deranged, though differently according to the precise seat and degree of the inflammatory irritation. This slight irritation, seated mostly in the cortical part of the kidney, is attended with augmented secretion of thin light-coloured urine, (*diuresis inflammatoria, polyuria inflammatoria* ;) in a more intense degree of the disorder the secretion is diminished (*oliguria*), or

altogether suppressed (*ischuria renalis*), and it is at the same time hot, red, and high-coloured, and voided with much pain in the neck of the bladder and along the urethra.

The other symptoms already mentioned arise either from sympathetic disorder of other organs, the suppression of the urinary secretions, or the presence of symptomatic fever, more or less violent. Vomiting, generally of greenish matter (*vomit^{us} porraceus*), with considerable anxiety, are ascribed in general to the nervous sympathy of the stomach, liver, and kidneys, especially when the right kidney is affected; at the same time this symptom may be the result of the irritation of the unsecreted urea. Cough and pain, aggravated by deep inspiration, are evidently occasioned by the motion of the diaphragm and its crura over the inflamed gland or glands, and the occurrence of hiccup is referable to the same cause. Gripping pains of the belly, sometimes with meteorismus, often with constipation, depend on the affection of the colon; and in many instances to the vomiting, abdominal pain and constipation, the name of renal colic is applied. The numbness of the leg of the affected side is generally ascribed to the pressure of the inflamed gland on some of the lumbar nerves; and the painful retraction of the testicle is ascribed to irritation of the spermatic nerves. The other symptoms, as quick, (100), strong, full pulse, heat, thirst, restlessness, and occasional delirium and convulsions, belong to the general febrile disorder.

The duration of the symptoms now specified varies according to the treatment, the cause or causes on which they depend, and the circumstance of the attack being a first one, or having been preceded by others. In ordinary cases of the acute, primary, or idiopathic disorder, they may be much alleviated in the course of twenty-four or forty-eight hours, and should be removed before the end of the third, or at most of the fifth day. Hildenbrand allows that the disorder is seldom protracted beyond the seventh day, when it is terminated either in favourable crisis, or the fatal event, or lays the foundation of incurable disorders of the kidney. This renders it requisite to consider the disorder with reference to its exciting causes.

ETIOLOGY.—Renal inflammation may take place either idiopathically or symptomatically, as a consequence of some irritation of the gland. Though the idiopathic form of the disease has been already mentioned to be rare, it is liable to take place in

the gouty, as a symptom of the gouty diathesis, and is indeed the form in which gout affects the kidney; and it is known by the individual having presented more or fewer of the symptoms of gout, and by the disease terminating in, or being alleviated by a paroxysm of regular gout.

Renal inflammation may ensue on blows or contusions on the loins; falls in which the kidney, with other organs, suffers concussion; carrying heavy loads on the back, or wrenches in consequence of falling in carrying loads; riding on horseback; riding in a carriage over a rough road; the presence of renal concretions or sabulous matter in the infundibula or pelvis, especially if the former be rough, or angular; various irritants taken into the stomach, which either induce acidity, or being absorbed by the blood-vessels, are enabled to irritate the tissue of the kidney, as some of the vegetable acids and fruits, acid wines, cantharides, the terebinthinate, resinous, and balsamic substances; cold applied to the lumbar region, especially when overheated; inflammation of the adjoining organs, as the liver, spleen, duodenum, colon, the psoas muscle, the dorsal or lumbar vertebræ; and in some instances inflammation of the bladder, extending upwards through the ureters, either resulting from excessive distension of these organs, or without distension.

Of the whole of these circumstances which may be regarded as exciting causes, the operation is very much favoured by the presence of the gouty or calculous diathesis already mentioned.

TERMINATIONS.—The terminations also vary according to the causes on which the disease depends.

Idiopathic renal inflammation may terminate in resolution, in an attack of gout, in the deposition of sand or sabulous concretions (*lithiasis*), in suppuration, in suppuration with extenuation of the kidney, in induration or softening of the kidney, and perhaps in granular deposition and transformation, or in death.

Idiopathic *nephritis* may, under the prompt use of remedies, terminate in resolution on the third, fifth, or seventh day. In this case the pain gradually or speedily abates and finally disappears, the vomiting ceases, the heat and thirst are diminished, the patient becomes less restless, and at length falls asleep, and the skin becoming moist, he awakes in general without any feeling of his former sufferings, with the pulse down at 80 or even lower, and begins to discharge without pain or uneasiness a considerable quantity of urine, usually dark-coloured, like brown dirty water

or coffee, which deposits on cooling a sediment dark-coloured, and sometimes slightly bloody. In the course of a day or two, if this amendment continue, the urine returns to its natural standard in quantity, quality, and appearance.

In cases of gouty diathesis, the pain of the renal region subsides or disappears, and at the same time pain, redness, and swelling, appear on the foot or hand, and pass through their usual course.

If neither of these results take place on or before the fifth or the seventh day, it may be apprehended that the disease is to terminate either fatally or in suppuration or abscess, or distension and attenuation of the kidney, or one or other of the events already specified.

When the fatal termination takes place, it is generally preceded by complete suppression of the urinary secretion, slow full pulse, stupor proceeding to coma, and a urinous exhalation from the surface of the body.

When *nephritis* terminates neither in resolution nor in death, it may be apprehended that it is to end in suppuration or some similar disorganizing process in the kidney; and though this may take place in the spontaneous or idiopathic form of the disorder, it is much more likely to ensue in cases in which the disease is induced by the mechanical irritation of an urinary concretion.

It is requisite here, therefore, to specify the circumstances under which suppuration is most likely to take place, and the usual forms under which it appears.

I. Though suppuration of the kidney may take place either in its cortical or secreting part, or in its tubular or excreting portion, yet, so far as the evidence of morbid anatomy goes, the most usual mode in which suppuration, or rather the secretion of purulent matter takes place, is the following.

1. An attack of renal inflammation may, if it affect mostly the tubular part of the kidney and the *infundibula*, terminate in the secretion of puriform mucus and blood from the calycine membrane, that is, the delicate mucous surface of these cavities, of the *papillae*, and from the mucous surface of the *pelvis*; and these morbid secretions may either escape through the ureter into the bladder, and be expelled, or they may remain and produce obstruction of the *pelvis*, secondary inflammation, and distension of the *pelvis* and *infundibula*.

In the former case, the matter escapes by the ureters into the

bladder, partially or entirely, and is discharged in the form of purulent matter mixed with urine, or purulent urine (*pyuria*); but it is liable again to accumulate, unless the inflammatory action is totally subdued. If it do accumulate, it then becomes, in all respects, similar to the latter case, and a peculiar state of the kidney is presented, (*Nephrotasia*; *Nephropyema*). The matter retained within the *pelvis* and *infundibula*, or at least not permitted to escape by the ureter, either mixed with urine, or by itself, gradually accumulates and increases in quantity, and causes more or less distension of the *pelvis* and *infundibula*. If this be moderate, and if death take place, the kidney, when divided, presents as many cavities containing purulent matter as there are *infundibula*; and, while the substance of the kidney is rendered much thinner than usual, these cavities are sometimes supposed to be purulent cysts into which the kidney has been converted. This, I have no doubt, is the true explanation of such cases as that mentioned by Cheston, who states, that in a boy of seven, "the substance of the kidneys was so dissolved into matter, that they appeared little more than cysts full of *pus*, the one weighing four ounces and the other three." (Pathological Inquiries, Chap. ii. p. 9, Gloucester, 1766.) I have seen several cases, in which otherwise good observers were deceived by this appearance, and were led to imagine that the kidney was converted into purulent cysts. The mistake is rectified by removing the purulent matter cautiously, and washing the cavities in pure water, when it is observed that the fine membrane covering the *papillæ* and lining the *infundibula* (*membrana calycina*,) is a little rough and thickened, sometimes covered with lymph, but not destroyed or marked by any breach of continuity; that the *papillæ* may be recognized also entire; and that the only change which has taken place is considerable distension by purulent matter, and consequent attenuation of the tubular and cortical part of the kidney.

The quantity of matter accumulated, however, may be considerable, the distension great, and the consequent attenuation of the renal substance may be carried to a great extreme. The first effect of this increased accumulation is, by the distension, to force two or more *infundibula* into one common and considerable cavity or sac; the next effect is gradually to force several *infundibula* into one considerable sac; and if the accumulation continue and the distension proceed, the *infundibula* and *pelvis*

are converted into one general extensive sac, containing purulent matter. In cases of this description, the cortical and tubular substance of the kidney are so much stretched and attenuated, that not unfrequently they are not thicker than a crown or a half-crown piece; and it might be imagined that these tissues were almost or altogether destroyed by suppuration, and that nothing is left but the external capsule. When, however, a proper section is made, the purulent matter evacuated, and the parts washed with pure water, the calycine membrane and the *papillae* may be recognized,—the former rough with lymph and thickened mucus, the latter much compressed; the separate tubular cones even may be traced very much stretched, indeed, and separated; and even the cortical structure may be perceived in the form of a thin exterior coating.

The size which the expanded and attenuated kidney may in these circumstances attain, is often very great, and the quantity of matter with or without urine very considerable. The older authors, as Blasius and Ott, have not distinguished the disease with accuracy or precision; and consequently I can make little use of their cases. But the kidney has been in this state found to be as large as the head of a child, and to contain almost two pounds or more of purulent, sero-purulent, or urino-purulent fluid; and in one case which was known to me, the left kidney was so much enlarged and distended, that it occupied the whole left side of the abdomen and extended into the pelvis. An excellent case is given by Corvisart in his Journal. (Tome vii. p. 387.)

This disease has been described by Frederic Augustus Walter in one stage, under the name of expansion of the kidneys, (*expansio renum*,) and in another under the title of dropsy of the kidneys, (Nierenwasserseuche,) (*hydrops renalis*.) Neither of these names are appropriate; and the latter is particularly improper, in so far as it conveys a just idea neither of the origin of the disorder, nor its nature, and is liable in the present state of pathological knowledge to be confounded with the secondary dropsical effusions which take place in consequence of granular degeneration of the kidney. The expansion is the effect of inflammation, which, by giving rise to morbid products, causes distension of the kidney, or rather its *infundibula* and *pelvis*, much as sero-purulent fluid within the *pleura* separates the lungs from the *pleura costalis* and ribs, and extrudes the walls of the chest. The sero-purulent, purulent, or urino-purulent fluid contain-

ed within the expanded *infundibula* and *pelvis* of the kidney, constitutes no resemblance or analogy between that fluid and those of dropsical effusions; and the name should therefore be discarded. If a particular denomination be wished for the disease, the term *Nephropyema* or *Pyonephria* is the proper one, and the term *Nephrotasia* may be used to signify the distension. It may be observed, however, that the latter is a mere effect of the accumulation of purulent fluid.

I am afraid also that Mr Howship has been misled by the same circumstance, when, in speaking of this change under the head of distension of the kidneys, he observes, that "by this means a degree of pressure is established, which, as it increases, induces by degrees a total resolution of the whole of the natural structure of the gland, which is ultimately found converted into an assemblage of large and small cysts, or thin membranous capsules." (Sect. 6, p. 13.)

That the great distension which in some cases takes place, may be sufficient to separate and detach forcibly from each other the individual component cones of the kidney, is a circumstance which I will not deny; but I must say that everything known regarding the effect of suppuration in this part of the kidney shows that this is not a common result; and that the most frequent consequence by far is that which I have here represented it to be. It is quite impossible to imagine the great changes produced by mere pressure and distension in the human body, without absolute destruction of the organization of parts, were it not the subject of daily observation, aided by accurate inspection of the state of the parts.

In some instances this purulent distension is confined to one or two *infundibula*, which do not readily communicate with the others, and in consequence the purulent matter contained within them does not escape into the other, but, being incessantly increased, causes expansion and enlargement at one part of the gland. In other cases it is confined to the *pelvis*, and produces on that the same effect which it would elsewhere, but leaving the kidney for some time comparatively uninjured.

The fluid contained may be purulent, sero-purulent, or sero-purulent mixed with urine, that is urino-purulent. In some of the cases described by Walter, the fluid is represented to have been clear and diaphanous.

It is proper, however, to say, that Walter, who had seen seve-

ral examples of this disorder from obstruction of the ureter by concretions, represents the whole kidney as so changed, that nothing seemed to be left except the exterior membrane or capsule, which was so much extenuated by the pressure of the contained fluid, that the part which was previously a kidney, presented the appearance of an expanded bladder. This distension he ascribes solely to the accumulation of urine, which, not being allowed to pass by the ureter, stagnates in the *pelvis* and *infundibula*, and by compression upon their excreting and secreting parts and vessels, first impedes and then suspends the secretion and excretion of the glands.

In instances of great distension he mentions that not only is all the perinephral fat absorbed, but the exterior membrane itself may be transformed into an osseous capsule, as was exemplified in various preparations preserved in the collection of his father. The description now mentioned is most applicable to that obstruction which results from the presence of a concretion in the pelvis or ureter.

2. *Nephropsammia ; Lithiasis Nephritica*.—An attack of renal inflammation may terminate in the secretion of a considerable quantity of sabulous matter, with or without puriform or morbid mucus and blood, and if this escape not by the ureter into the bladder, and be thence expelled in the usual manner, the sabulous matters are aggregated by the viscid mucus and other morbid secretions into masses moulded in one or more of the *infundibula* or the pelvis; and there they remain constituting urinary renal calculi; in which case they may, either with or without inflammation, cause obstruction in the excretion of the urine, and consequent expansion of the renal *infundibula*.

3. *Nephropyema Calculosa*.—Though it is well ascertained that calculi if round do not always give rise to symptoms of uneasiness or pain in the dorso-lumbar region, or to symptoms of renal inflammation, yet they are very liable to do so during the operation of any of the ordinary exciting causes of inflammation, as external violence, exposure to cold, or a long and fatiguing journey on horseback, or the operation of the particular causes of renal irritation, as the use of acidulous articles of food or drink, the absorption or the internal use of cantharides, or the use of the turpentine, or resinous, or balsamic articles.

Either after or without the operation of one or other of these causes, the patient is attacked with the symptoms of pain in the dorso-lumbar region, shivering, squeamishness, numbness of the

high, pain or soreness or retraction of the testicle of the same side, scanty urine or total suppression, or bloody sedimentous urine and constipation. In some cases the severity of these symptoms undergoes, either in consequence of remedies or spontaneously, temporary alleviation; urine tinged brown with blood is expelled; and shortly after, quantities of sabulous matter or minute concretions are discharged.

In some instances purulent matter is voided more or less copiously with the urine, and is observed to fall to the bottom of the vessel, presenting its usual appearance and characters. Such a circumstance is generally conceived to indicate suppuration of the kidney. In one sense it certainly does denote the presence of this process, but not in the sense commonly understood. Though it be generally said that the kidney then suppurates, yet this is not necessary either to the termination of the disease, or the appearance of purulent matter in the urine. A more common result is purulent or suppurative inflammation of the fine mucous membrane of the *pelvis* and *infundibula*, and consequent distension of the renal tubular cones, but without destruction of their substance. It should never be forgotten, that the presence of a urinary concretion in the *pelvis* or *ureter* may cause inflammation and suppuration without that suppuration affecting the proper substance of the kidney; and that suppuration of the kidney may take place without the presence of a concretion in the *pelvis*, or *ureter*, or any of the *infundibula*. If the stone be by any means expelled and carried into the bladder, the purulent matter may also escape, and after being discharged, the kidney may contract, and the morbid secretion may cease. Hence it is found that discharges of purulent urine may take place for some time, and eventually cease, without preventing the patient from recovering temporarily.

More frequently, however, the reverse is the case. Though the calculus may be discharged, the purulent matter may not be evacuated, or the purulent inflammation continues; and even the stone itself, forming a sort of cyst of the *pelvis* or *ureter*, may remain firmly impacted, and prevent the issue either of urine or purulent matter. In either case, the expansion of the kidney (*Nephrotasia*) continues and increases; the tubular cones are distended, compressed, and extruded; the *papillæ* are compressed, flattened, and almost obliterated; the cortical covering is also distended and extenuated; and the exquisite stage of the lesion already described as *Nephropyema* (*Pyonephria*)

is fully established. Even ulceration of the parts around the concretion, wherever it happens to be fixed, may take place, and give rise to great and irreparable ravages in the renal tissue, and that of the contiguous organs.

It is not uninteresting to trace the subsequent progress of this disorder, and to observe what singular and extraordinary efforts are sometimes made to counteract the mischief in the kidneys, and its effects on the constitution, and to prevent the immediately fatal effects of the disorder.

Eight different terminations may in this state of the disorder be mentioned.

a. The first termination requiring notice is, that the disease may pass into the chronic state, in which the inflammatory process in the *infundibula* and *pelvis* continues, causing the secretion of purulent matter, which is voided with the urine, (*pyuria*), and attended with quick pulse, nocturnal sweatings, wasting, and all the symptoms of hectic fever. It is further requisite to observe, that this state is liable to alternate with, or terminate in, an acute attack of the disease, in which the purulent secretion is suddenly suspended or stopped, pain in the renal region is induced or augmented, with the other symptoms of renal inflammation, and terminate not unusually, if not checked, in sopor and fatal coma, with urinous exhalation from the surface of the body.

In those instances in which a calculus remains impacted in the pelvis or ureter, these attacks are several times repeated, until the kidney is very much enlarged, distended, and attenuated by the large quantity of purulent or sero-purulent fluid, which never being allowed to escape, is progressively augmented by the addition of that which is secreted at each new attack. Death seems then to be the united result of the repeated inflammatory attacks, and the lesion inflicted on the structure of the kidney. Of this mode of termination instances are given by Tulpius, (lib. 2, cap. 45,) and Job a Meekren, (c. 45;) in the Memoirs of the Royal Society of Medicine, 1780-81, Paris, p. 272; by Fourcroy, (*Medecine Eclairée par les Sciences Physiques*, ii. p. 253;) and a melancholy and remarkable example occurred, in 1821, in the person of a medical practitioner of this city, in whose body the left kidney was found dilated so much as to contain nearly three pounds of sero-purulent fluid, which had been the product of several attacks of renal inflammation, occasioned by the presence of a small mulberry calculus, weighing only $1\frac{1}{2}$ grain, im-

pacted in the upper end of the ureter. (Edinburgh Medical and Surgical Journal, Vol. xviii. p. 557 and 561.)

In such circumstances, there is reason to believe that the diseased kidney ceases to secrete urine; since its texture is so much injured, and its circulation is employed in the maintenance of a morbid secretion; and that the functions of both are performed by the sound one.

b. In the second place, ulceration may take place through the pelvis or ureter, and purulent matter escape into the lumbar and pelvic adipo-cellular tissue. Such a termination is necessarily fatal, as it induces a sloughy mortified state of the lumbar and pelvic adipose membrane, the effect of which on the system at large is speedily fatal. Of this mode of termination a good case is given by Mr Howship, in Case 7, (p. 43), in a person between 60 and 70 years of age, in whom the matter eventually passed by a small round ulcerated aperture of the peritonæum into the general abdominal cavity. A similar case is recorded by Chomel. (Archives Gen. xliii. p. 12.)

c. In the third place, the matter may pass directly through the *peritonæum* into the cavity of the abdomen, establishing a direct communication between the *infundibula* and *pelvis* of the kidney and the latter cavity. This is mentioned by Chopart; but it seems to be questioned by Chomel, because no cases are specified by the former. It is proper to mention, therefore, that an instance of this mode of suppurative destruction is afforded in the sixth case by Mr Howship, (p. 49,) taking place in the person of a boy of 7, who had laboured under symptoms of urinary disorder from the age of 18 months, and in whom both kidneys, but especially the left, presented marks of suppurative inflammation, and a communication had been established between the surface of the left kidney and the cavity of the peritonæum, and the matter had thereby escaped into the interior of the latter.

d. A fourth mode in which the purulent matter may escape, is into the transverse arch of the colon, especially if it be the left kidney. Of this mode of issue Fanton records an instance; and in the year 1832, in inspecting the body of a woman destroyed by cholera, I found a state of parts which shows that the same issue must have taken place in that case. In the transverse arch of the colon was a fistulous opening leading into the pelvis of the right kidney, in which and the expanded renal substance was contained a large calculus.

e. In the fifth place, the communication may open, and the

matter be evacuated into the sigmoid flexure or rectum. Of this an instance is recorded by Bonnet (in the seventh volume of the *Journal Hebdomadaire*, p. 397, and *Archives Generales*, Tom. xxiv. p. 278), in the person of a young woman.

f. A sixth mode in which renal abscess has been observed to procure an outlet for itself is by producing ulcerative destruction of the diaphragm and *pleura*, and evacuating its contents into the lungs and *bronchi*. Of this De Haen gives an instance, in which, in the person of a young man of 15, after symptoms of renal inflammation, purulent matter was first voided with the urine, and, after the interval of three or four years, during which the individual recovered his health so far as to be able to marry, he was attacked with symptoms of intense inflammation of the chest, he expectorated fetid sanious reddish purulent matter, and had most laborious breathing; and eventually he died hectic. It was then found that the left kidney was dilated into a large sac or cyst without any trace of the original gland; the ureter was distended to the size of the small intestine, and was filled with purulent matter; a large aperture was found in the diaphragm, forming a direct communication between the left kidney and the lower lobe of the left lung, which was destroyed, with the lower part of the upper lobe. (*Ratio Medendi*, Tom. x. p. 103.)

g. A seventh mode in which the renal abscess may procure an issue for its contents is into and through the liver or spleen, the right kidney by the former, the left by the latter, towards the surface. This mode of termination, which is assigned by Peter Frank, is received with doubt by Chomel. It may be observed, however, that Mr Howship gives, in his eighth case, (p. 47), the history of an attack of inflammation of the right kidney, in which a large abscess of the right kidney pointed over the region of the liver, and was there opened, and discharged five pints and a half of matter; and though after death, which took place forty-two days after the operation, the substance of the liver was found healthy, its inferior surface was united by adhesion to the superior extremity of the right kidney.

h. In the eighth place, the matter of the renal abscess may open a path for itself posteriorly through the back part of the pelvis or ureter or kidney, and the dorso-lumbar cellular tissue, muscles, and fasciae, so as to point on one or other side of the spine. Of all the modes of proceeding outward, this is the one which

has been most frequently observed ; and as it has often suggested to surgeons the expediency of making an incision in suspected cases of renal concretion, it is chiefly in the writings of surgeons that accounts of it are given.

Of this mode of issue, instances are recorded by Fontan, Tulpius, (iv. chap. 27) ; Job a Meekren, (cap. xlv.) ; Cheselden, (Anatomy, Book iv. chap. 1.) ; Petit, (Oeuvres Posthumes, iii. p. 73.) ; and in the Memoirs of the Academy of Chirurgery, ii. p. 233.

The concretion giving rise to ulceration, first of the kidney or its pelvis, or the top of the ureter, causes at the same time suppurative and adhesive inflammation, proceeding gradually to the surface, where it forms a prominent tumour, red, painful, soft and fluctuating, and, either a spontaneous opening taking place or after an incision, matter is discharged, and not unusually with that one or more urinary calculi, or sabulous matter and urine. The swelling subsides after the first discharge of matter ; but the aperture evinces no disposition to close, and matter continues to be discharged for months or years, while a long sinus or fistula leading to the kidney is maintained. It is then a renal fistula, discharging matter, and sometimes urine and sand, or urinary concretions. If the opening happen to become closed, much pain is produced, and all the former symptoms of nephritis ensue, until fresh suppuration takes place, and the aperture is re-opened. Hence Lassus,* Monteggia,† Boyer,‡ and other surgeons, recommend that the fistula be kept open by a bougie, a cannula, prepared sponge, or a bit of charpie, in short, by some dilating body.

As in most of the cases now specified, the local disorder of the kidney, if it do not prove immediately fatal, gives rise to more or less hectic fever, with wasting and loss of strength ; the condition of the system thus induced was early designated by the name of renal consumption, (*phthisis renalis*).§ This name, though retained by Hildenbrand and several moderns, is not proper, because it is liable to lead to confusion ; since the term *phthisis* is no longer general, but has been by most modern nosologists restricted to the particular form of wasting which depends on tubercular destruction of the lungs. A more convenient appellation would be *tabes renalis*.

* Pathologie Chirurgicale, i. xxvii. p. 163.

† Istituzione Chirurgiche.

‡ Traité des Maladies Chirurgicales, T. viii. p. 505, 508.

§ Jac. Fabricii, Disputatio de Phthisi Renali. Giessæ, 1699.

Gangrene.—The question whether renal inflammation ever terminates in gangrene has been proposed by Chomel. Fabricius Hildanus mentions that in his own son, a boy of 7, he found the kidneys and neighbouring parts inflamed and degenerated into gangrene; and Chopart records the case of a person of 62, who died on the ninth day of symptoms of nephritis, in whose body he found the kidneys bulky, livid, mottled with blackish spots, and easily lacerable. In neither of these cases does the pathologist recognize positive evidence of gangrene; and Chomel is therefore inclined to doubt the termination; but he allows that, in cases of persons who have died after long continued suppuration of the kidney, some parts of the suppurating surface presented the dark colour, or grayish, the peculiar odour, the softness, and the absence of apparent organization observed in mortified sloughs.

As an instance of this lesion, Walter records a curious case which took place in the person of a young woman who had laboured for many years under violent pains in the region of the kidneys; and who was at length attacked with inability to void urine, in place of which she had a continual discharge of purulent matter, mixed with blood and fine sand. The belly swelled so much that she was imagined to be pregnant; but she suddenly fell down dead. Upon inspecting the body, Walter found the right kidney enlarged into a great spheroidal swelling, ten inches in the long diameter, six in the transverse, its substance of a brownish-red colour, very soft, and so easily lacerable, that on the slightest touch an opening was made. Internally it was altogether consumed, and its cavity was filled with an astonishing quantity of coagulated blood, purulent matter, and dissolved renal substance. This mixture, which resembled a sort of soup, enclosed two concretions, one weighing two drachms, the other two scruples, which could not be discovered till some of the mixture was emptied. On further investigation, Walter found that some of the large renal vessels had been eroded and laid open; and to this he ascribed the sudden death of the woman, and the quantity of blood found in the kidney.*

This, I think, must be regarded as a pretty unequivocal case of gangrene of the kidney. The termination must, nevertheless, be regarded as rare.

* Einige Krankheiten der Nieren und Harnblase. 4to. Berlin, 1800. §. 11, seite 5.

Mortification of the perinephral adipose membrane is a common consequence of inflammation of that tissue. But it belongs to another head.

II. *a. Suppurative inflammation of the Kidney.*—Though I have represented suppuration of the kidney to commence, in ordinary circumstances, in the interior of the *calyces* and pelvis, and rather to produce a sort of expansion and distension of the gland than an actual purulent destruction, it is, nevertheless, necessary to say, that purulent destruction does take place in the substance of the kidney. Of this I have seen several instances,—two of which were shown me by the kindness of friends,—one by Dr Scott Alison of Tranent. In these cases, the whole kidney was completely converted into a quantity of thick purulent matter, partly like thin putty, partly more fluid, all of which was contained within the renal capsule, like atheromatous matter in a bag or cyst.

In all the cases of this disorder, excepting one, the patients presented no evident or prominent symptoms which could lead to the suspicion that the kidney was in a state of inflammatory disease. In one case, death took place after an obscure illness of a few days. In the case which I have mentioned as an exception, the patient was hectic, and had uneasiness in the bladder and along the ureters; but, as it was plain that the lungs were tuberculated and presented open *vomicæ*, the hectic symptoms were justly ascribed to the presence of the pulmonary disorganization. If we say that this lesion is of strumous origin, we merely give another answer, without coming more closely to the explanation. It seems as if the whole renal tissue, cortical and tubular, were liquefied or dissolved in purulent matter.

b. Small patches of purulent matter are occasionally observed in the cortical or in the tubular part of the kidney, without apparent connection with inflammation of the *calyces*. These, I think, must be admitted to be of strumous origin. In the last instance, in which I witnessed this state of the kidneys, it took place in the body of a sickly strumous boy of fifteen years, the same who died of lobular *pneumonia*.

c. In some instances of inflamed vein, purulent matter has been found in the substance of the kidney. This has been regarded as metastatic; but it is most correct to look on it as transported from the vein inflamed to this in common with other internal organs.

III. *Cartilaginous induration of the Ureters and Pelvis, pro-*

ducing or accompanied with Renal Inflammation.—It is proper to mention here, that the ureters and pelvis are liable to a particular kind of chronic inflammation, inducing great thickening and induration of the mucous membrane, with roughness of its inner surface. In the most marked case of the disorder which I have seen, this state extended from the bladder upwards, through the ureters on both sides into the pelvis and calyces of the kidneys. The ureters were rendered thick and firm like cartilage; their size was increased to about five or six times the usual size; their canal was also enlarged; and their firmness prevented them from collapsing, as in the healthy state. The morbid state now mentioned appeared to have originated in the mucous membrane, but eventually to have affected the other tissues. It was difficult to say whether it had commenced in the membrane of the *calyces* or in that of the ureter, and extended to the former; for both were affected in nearly equal degrees.

This change was accompanied with painful and difficult micturition, the urine containing puriform mucus and sand, quick pulse, much thirst, hot dry skin, alternating with shiverings and sweatings, wasting, loss of strength, a most anxious miserable expression of the countenance, and slight incurvation of the person, as if under the suffering of much pain. The disease had been of long duration, at least several months.

IV. *Abscess of the Kidneys simulating disease of the Spinal Chord; and inflammation of the Calycine Membrane from injury or disease of the Spinal Chord.*—A singular effect of renal inflammation and suppuration is to induce *paraplegia* and symptoms of diseased spine. It has been long known that injuries and diseases chiefly of an inflammatory character in the spine or spinal chord, were liable to be followed by various morbid states of the urinary secretion, which was generally rendered alkaliescent or ammoniacal, sometimes deposited the ammoniaco-magnesian phosphate, sometimes the carbonate of ammonia. Bellingeri had observed, that in animals, after experiments on the spinal chord, inflammation was liable to attack the kidneys and the *peritoneum*, and render the former red and vascular, and cover them with lymph. Mr Stanley has shown, by a judicious selection of cases, that when the spinal chord is supposed to be diseased or injured, either directly or in consequence of disease or injury of the *vertebræ*, causing pain in the back and *paraplegia*, the symptoms so produced did not originate from disease of either the *vertebræ*, the chord, or the membranes, all

of which were sound, but from inflammation or suppuration of the kidneys, in which in general were found collections of purulent matter. From such cases it must be inferred, as Mr Stanley has done, that disease originating in the kidneys simulates, and may give rise to disease in the spinal chord, probably by a reflected influence from the diseased gland through its nerves to those connected with the spinal chord. It may conversely be inferred, that in any morbid state of the spinal chord, the impaired influence of the nerves over the renal action allowing the urine to be secreted in the kidney in an alkaline state, gives rise to a new train of evils, by the irritation necessarily induced in the tubular part of the kidney and in the calycine membrane. The ammoniacal urine then irritates perhaps both the cortical and the tubular part of the glands, and must certainly irritate the calycine membrane, and is the cause of the inflammatory states which it often presents. I must only on this head refer the reader to the excellent paper of Mr Stanley (*Medico-Chirurgical Transactions*, xviii. p. 260,) and to what I have said under the section on *Myelitis*, p. 398.

PROGNOSIS.—The prognosis in *Nephritis* is in general not favourable. But it is more favourable when the disorder is the result of external violence, than when it is the effect of any internal cause. In gouty and calculous patients, the prognosis is unfavourable, because it generally after one attack recurs several times, until it undermines the strength by renal or vesical calculus, or by the formation of renal abscess, or by total suppression (*Ischuria renalis*,) causes speedy death.

Renal abscess or *fistula*, though almost uniformly leading to death, is not necessarily a fatal disorder; but in whatever of the forms specified it appears, life is always maintained in a most uncomfortable and precarious condition. The least unfavourable is, where none of the unnatural communications or *fistulae* have taken place, and where the purulent matter has procured an outlet for itself through the ureter into the bladder, and thence been discharged externally. In some instances, recovery has been effected after this event had taken place. Forest mentions (lib. xxiv. obs. 37,) the case of a priest, who, after discharging purulent urine for three months, and being reduced to the greatest emaciation, recovered under the use of proper regimen, consisting chiefly of milk. M. Chomel records from M. Meniere of the Hotel Dieu, a case in which a similar recovery must

have taken place. The right kidney was shrunk into an irregular mass, about the size of a pigeon's egg, forming a species of membranous sac, consisting of the *calyces*, pelvis, and ureter, containing about half an ounce of clear fluid, but totally void of any trace of cortical or tubular portions. This constitutes what some have named Atrophy of the kidney, which, doubtless, is the effect of suppurative destruction followed by contraction of the remaining parts.

DIAGNOSIS.—Renal inflammation must be distinguished from the symptoms produced by a calculus in the ureter, from lumbago, from *psoaditis* and lumbar abscess, from *peritonitis*, intestinal inflammation, colic, granular disease of the kidneys, and from spinal irritation and inflammation, and disease of the spine generally.

When the ureter is obstructed by a stone the pain is infinitely more acute than when the substance of the kidney is inflamed, but the pulse is less frequent. There is also on the skin of the belly, midway between the *os ilium* and navel, a sympathetic pain, which is much increased by the slightest pressure, and disappears in general as soon as the concretion passes into the bladder.

Inflammation of the kidney may be distinguished from rheumatic affections of the dorsal muscles by the sickness, variation of the urine in quantity and quality, by the pain remaining much the same in every position of the body, and by soreness or retraction of the testicle. In rheumatism there is no sickness, no variation in the discharge of urine, no affection of the testicle, and the pain is most felt on raising the body.

It may be distinguished from inflammation of the cellular membrane under the lumbar muscles, and inflammation of the lumbar muscle itself (*psoaditis*,) by the pain not being increased by rotating the thigh, by the sickness, by affection of the testicle, by variation in the flow of urine, and, if it continues long, by the absence of wasting of the flesh. In inflammation of the lumbar muscles, on the contrary, there is no sickness, no affection of the testicles, the pain is deep-seated, much the same in all positions of the body, but considerably increased by rotating the thigh, and if the disease has continued long, the flesh is greatly wasted.

It is not so easily distinguished from inflammation of the intestines, at least in the commencement. But if the disease has continued some time without inducing serious symptoms, and

without much emaciation, it may be inferred that it is seated in the kidneys.

From spasmodic pain of the intestines it will be readily distinguished by the presence of fever, and the state of the urinary secretion, and especially by the pain being constant.

THERAPEUTICS.—The therapeutic indications to renal inflammation consist in abatement and removal of inflammatory action by every part of the antiphlogistic regimen, the allaying of irritation by sedatives, demulcents, and the warm bath, and the restoration of the secretions of the skin and kidneys.

Fifteen, twenty, twenty-five or thirty ounces of blood should be taken from the arm at the first; and if the pain in the region of the kidney does not abate in twelve hours, and the pulse remains hard and frequent, venesection may be repeated to the amount of twenty ounces,—beyond which it will seldom be requisite to carry the evacuation. The castor oil draught should also be given at the first, so as to open the bowels without gripping or irritation. If the stomach, as is sometimes the case, cannot bear any oily medicine, it is requisite to administer immediately after the first bleeding, a full dose of an opiate, which generally relieves local pain, allays general irritation, and promotes moisture of the skin, and the operation, in the course of six or eight hours, of the laxative. If the exhibition of the opiate is thought inexpedient, glysters of warm water, either alone, or containing opium, or the solution of muriate of morphia, will afford much relief.

The almond and mucilaginous mixture is recommended by Pemberton, after taking the castor oil draught; but the best and most convenient drink is a little common tea or coffee, or linseed, sage, or any other vegetable ptisan. The warm bath at 98° or 100 is also of sovereign use, whether the disease arises spontaneously or from the mechanical irritation of a urinary concretion. Diuretics have been recommended, but these are of no use or improper. The physician should always remember that the best diuretic, in such circumstances, is the lancet; and that if this, aided by suitable local depletion and the warm bath, fail, no medicinal agent will be of much use.

If, notwithstanding the diligent and judicious use of these measures, the disease proceed to suppuration and pass into the chronic stage with hectic fever, in such circumstances, great benefit will be derived from the use of the whortle-berry powder (*Arbutus Uva Ursi*,) (*Arctostaphylos Uva Ursi*, Sprengel,) in doses of

from ten grains to a scruple, or a scruple and a half, three or four times daily. The infusion of buchu leaves, also (*Diosma crenata*,) (*Agathosma crenatum*, Willd.) has been strongly recommended as very useful; and the decoction of the root of the *Pa-reira brava*, or wild vine (*Cissampelos Pareira*,) an old remedy, has been recently brought into notice as beneficial. In this state of the kidney also lime-water, or even alkaline medicines are useful; but they must be cautiously managed, and ought to be given only with a knowledge of the state of the kidney and urine.

Cullen and most systematic authors have made a distinction between the treatment of idiopathic renal inflammation, and that resulting from stone in the kidney or ureters (*Calculus Renalis*), (*Nephritis Calculosa*.) The distinction is rarely admissible in practice; at least it is not always easy to determine in any given case, whether the symptoms arise from mere inflammation, or from inflammation in consequence of a stone impacted in the pelvis or ureter. If any distinction is requisite, and any modification of treatment desirable, it is simply in the more prompt and vigorous use of the means adequate to prevent suppuration, and promote the descent of the calculus. This will be effected by blood-letting, the use of the warm bath, the hip-bath, opiates liberally by the mouth, and by the administration of the starch glyster, the tobacco glyster, and diluent mucilaginous fluids.

§. X. Inflammation of the Prostate Gland. *Diseased Prostate. Prostatia.*

A Treatise on Gonorrhœa Virulenta. By Benjamin Bell, Chap. ii. Section vi. Third stage of Gonorrhœa Virulenta.—A Treatise on the Venereal Disease by John Hunter, 4to London, 1788, or New Edition of the Works of John Hunter, Vol. ii. Part iii. Chapter 8th, 8vo. London, 1835.—Morbid Anatomy, by Matthew Baillie, M.D., Chap. xvi.—Practical Observations on the Treatment of Diseases of the Prostate Gland, illustrated by Copper-plate Engravings. By Everard Home, Esq. Vol. i. London, 1811, Vol. ii. London, 1818.—A Treatise on the Diseases of the Urethra, Vesica Urinaria, Prostate and Rectum. By Charles Bell, London, 1820, p. 50, 51, 55.—A Treatise on the Nature and Treatment of Scrophula, &c. By Eusebius Arthur Lloyd, M. R. C. S. London, 1821. Part. ii. p. 107. Scrophulous Affection of the Prostate Gland.—A Practical Treatise on the Symptoms, Causes, Discrimination, and Treatment of some of the most important complaints that affect the Secretion and Excretion of the Urine, &c. By John Howship, Member of R. C. of Surgeons in London. Lond. 1823. Part ii. Chap. ii. §. xvii. Retention from enlarged Prostate Gland.

THE prostate gland is liable to acute and chronic inflammation.

A. Acute *prostatia* may take place either in consequence of cold, local injury, or any similar cause; but the most frequent way in which it is produced is in consequence of urethral inflammation in clap, spreading to this part of the urethra, and

there producing inflammation, first of the surrounding cellular membrane, and then of the gland itself. The most usual symptoms are fixed pain, very severe, in the upper part of the *perinæum*, sense of fulness and tension in the vicinity of the anus; great desire to void urine, which passes away only in drops with much scalding pain, or is entirely suppressed; tenesmus and general irritation with considerable acceleration of pulse, heat and thirst. In some rare examples the pulse is not much more frequent than in health; but the local symptoms with the general irritation, heat, thirst, and restlessness, will show that the gland or its cellular tissue is inflamed. The penis is generally tender, and in some instances there are painful erections and priapism. It may be admitted, that the inflammation first affects the mucous surface of the ducts, then the submucous and contiguous cellular tissue, and lastly, the gland itself. If the inflammation be not speedily resolved, it will terminate either in abscess, or scrofulous inflammation, or it will become chronic.

This disease is most common in young robust adults, and in general is a consequence of protracted or mistreated clap; it may also follow sexual intercourse, which has taken place too soon after the disappearance of clap.

The treatment consists in general and local blood-letting, gentle eccoprotics, never *catharsis* or purging, the warm-bath and hip-bath, and the administration of opiates and narcotic preparations. Of these, perhaps, hemlock is the best, and may be given either by the mouth or in the form of suppository. The food should be light and unstimulating,—mere gruel, or vegetable ptisans. During convalescence, the tincture of muriate of iron will be found a useful tonic both generally and locally.

B. Chronic *prostatia* is a very formidable and distressing disease. It consists in a slow inflammation of the substance of the gland, during which it gradually enlarges either partially and generally, with a sense of pain not acute, but dull or gnawing, but without either suppression of urine or tenesmus in the commencement of the disease. The approach of the complaint is generally preceded by discharge of mucous fluid rather thin from the urethra, by sense of uneasiness about the perinæum and neck of the bladder, and by an uneasy irritable state of the general health. The patient is languid, liable to become easily heated, his stomach is rarely good, and, with an anxious countenance, he seems to lose flesh. These appearances may be considered to indicate a chronic inflamed condition of the

prostatic ducts, or the prostatic part of the urethra. In a short time the patient remarks that the urine comes away in a smaller stream, or with greater difficulty than usual, and its expulsion is succeeded by a dull heavy gnawing sensation between the fundament and perinæum. The introduction of the finger *per anum* does not uniformly recognize enlargement of the gland, as in the acute disease; but if pressure be made and continued, the same kind of gnawing pain which succeeds voiding the urine follows after withdrawing the finger, and continues longer, in general, and more severely. These local sensations, with a languid imperfect state of the general health, with heat of surface, interrupted sleep, and a desponding peevish state of the mind, are the general symptoms which denote chronic inflammation of the prostate gland. The particular symptoms will depend on the part affected, and on the habit of the individual.

Two forms of chronic *prostatia* have been noticed by pathologists; one—the common chronic inflammation occurring at a late period of life,—seldom before the fortieth year; the other—chronic inflammation taking place in early life, and connected with the strumous diathesis.

The ordinary chronic *prostatia* may occur in any individual who has lived above the fortieth or fiftieth year; for it appears that the disadvantageous situation of the prostatic veins and other vessels near the neck of the bladder, has a peculiar tendency to retard the motion of the blood returning from them to the heart, and to dilate them unnaturally in all persons at this period of life; and when this structural disposition is favoured by the operation of occasional or habitual exciting causes, it rarely fails to produce more or less of chronic inflammation or other disease of the gland. It is certain, however, that the mere venous congestion, and the varicose state of the vessels, are not of themselves sufficient to create this disease; and it has generally appeared in consequence of the auxiliary power of all those causes which are known to favour accumulation of blood in the gland. Of this kind are excesses in sexual intercourse, especially when the act is stimulated by partial intoxication; habits of ebriety; frequent attacks of urethral inflammation mistreated, neglected, or aggravated; hard or frequent riding, especially if persisted in till a late period of life; improper or injudicious use of injections, instruments, &c.; habitual constipation; and exposure to cold under particular circumstances. In some cases vesical or prostatic calculus seems to have operated

in the same manner. The operation of exciting causes is always most powerful in that broken down state of the constitution which generally succeeds long sedentary habits, intemperate use of the pleasures of the table, long residence in hot climates, or even the habitual and frequent addiction to the venereal act.

Dissections have shown that the gland may be generally affected; that is, that its whole body may be painful, and generally enlarged. It is more usual, however, to find only a part of it much or seriously diseased;—and either both the lateral lobes may be affected, or only one; or these may be sound, and the middle or third lobe may be the seat of the morbid process. The middle lobe, indeed, is generally found to be the part affected in old age; and if the disease is moderate, or of short continuance, it merely swells forwards towards the bladder, and projects into the cavity of this organ at its neck in the form of a tumour of greater or less size. The expulsion of urine is not always obstructed, but it is generally voided in a small stream, after much straining, seldom completely, and with aggravation of pain in the perinæum. The introduction of an instrument is also accomplished with difficulty, and the ordinary silver catheter is generally prevented from entering, while an elastic gum one may be introduced by the contrivance of Mr Hey, viz. by withdrawing the stilette after the point of the instrument has attained the prostatic part of the urethra. In some cases, however, the patient is distressed with occasional fits of retention of urine; and, in general, these can be traced to exposure to cold, fatigue, disorder of the stomach, a small irregularity in the use of wine or spirits, or, it may be, a complete fit of intoxication. These symptoms will, in general, indicate the presence of what has been termed *disease or enlargement* of the middle lobe of the prostate gland. It cannot be doubted, that, notwithstanding the vague manner in which authors have spoken of this affection, it is to be viewed in most cases as an example of chronic inflammation. The substance of the gland is more crowded with veins and other vessels than usual; the veins are distended and varicose; the gland is generally enlarged in consequence of extravasation of blood or lymph into its substance; and if the process be not suspended or interrupted, or subside spontaneously, it gives rise to the formation of abscesses, or ulceration, or terminates in hard disorganization.

Sir Everard Home considers enlargement of the middle lobe to depend on a state of the gland similar to that of the cerebral vessels in apoplexy, and thinks that the occurrence of venous hemorrhage from the gland in consequence of horse exercise or other violence, shows that the swelling may depend on effused blood. This last circumstance of actual extravasation is, however, not necessary to account for the phenomena. If it be clearly established that the capillary vessels of the gland or its middle lobe are much enlarged and distended with venous or other blood; that the veins are varicose, and simply liable to rupture; it is easy to see that this state of the vessels will produce not only enlargement of the parts, but more or less tenderness and pain, and will, in most cases, be accompanied with effusion of serous fluid into the substance, constituting œdema, or of lymph, constituting permanent swelling, or, lastly, may slowly terminate in the formation of purulent fluid, abscesses, and ulceration.* That this is frequently the pathological condition of the gland, the occasional disappearance of all the bad symptoms under proper treatment further distinctly shows. It is absurd to object to this view of the nature of the disease, that it has been considered by most authors as a scirrhus enlargement of the gland. I will not deny that the prostate or its middle lobe may become scirrhus; but I do not hesitate to assert, that no precise description of scirrhus prostate has yet been published, and that authors have employed this term in reference to diseased prostate, as loosely as they have done regarding other organs, whether glandular or parenchymatous. It is, indeed, manifest, that what Dr Baillie has described as scirrhus of the prostate is nothing else but simple enlargement of the natural structure, with deposition of lymph into its substance. "Although," says this intelligent and candid pathologist, "I have given the name of scirrhus to this affection of the prostate from its hardness, and the similarity of its structure to that of scirrhus in some other glands, yet it would seem to be essentially different from it. This disease has little or no disposition to run into ulceration (*i. e.* cancerous ulceration), and it is capable of subsiding, which would not be the case if it was a true scirrhus."† In like manner, Sir Everard Home distinctly asserts that swelling of the prostate is not to be considered in the light in which

* Vide Home's 18th Case, Vol. ii. p. 149, and Case 5th, p. 52.

† Morbid Anatomy, Chap. xvi. p. 376.

tumours are generally viewed by medical men; it is not a new part formed by some unnatural action of the blood-vessels as tumours in general, nor is it an excrescence from the body of the gland, as has been generally supposed; but it is an enlargement or swelling of a natural part, as much so as an enlargement of the tonsils in consequence of inflammation, and like them by quietness and such means as lessen inflammation, it subsides.”* The disease is in truth chronic inflammation in various degrees and different stages; and the appearances displayed on incision of the enlarged gland indicate either this process or some of its effects.

Chronic inflammation of the prostate is accompanied with three effects, which should be well known to the practitioner. The first is a copious discharge of ropy mucus, which issues from the excreting ducts of the inflamed gland, and indicates inflammation of the fine mucous membrane with which these canals are covered. This morbid secretion is very viscid, and with difficulty removed from the extremity of the urethra, and so irritating that it scalds or excoriates the surface over which it passes. The second effect is inflammation of that part of the internal or mucous membrane of the bladder in immediate contact with the swelled gland. This may spread over the whole surface, rendering the bladder extremely irritable, and forcing the patient to frequent and ineffectual straining to void his urine, which is scanty,—and may ultimately affect the muscular coat, causing it to contract permanently and irregularly, and thereby diminishing the capacity of the organ. It is attended with the usual discharge of filamentous mucous or lymphic shreds, or even purulent matter, which may be observed at the bottom of the vessel in which the urine is emptied. (Home, Vol. i. p. 33–35). The third effect which may attend chronic *prostatia* is hemorrhage from the gland from sudden pressure. Almost invariably after riding the urine is more or less mixed with blood, and in some instances this discharge may be so profuse as to issue from the urethra like the blood from a vein which has been opened by the surgeon. Home ascertained that this hemorrhage is occasioned in general by the rupture of a vein or veins in the enlarged gland.

This disease is to be distinguished from stricture of the urethra, with which it has been generally confounded, from catar-

* Vol. i. p. 103.

rhial inflammation of the bladder, from stone in the bladder, from stone in the kidneys (*haematuria*), and from hemorrhage from the mucous surface of the ureters, bladder (*cystirrhagia*), or urethra (*urethrorrhagia*).

THERAPEUTICS.—Before the structure of the prostate gland was well understood, this disease was believed incurable; and this opinion is still allowed too often to influence the practitioner. The researches and experience of Home show that this is an erroneous view, and that, under proper management, the morbid growth may be reduced in many cases, and that in all, except the most aggravated and in very old broken down subjects, the sufferings of the patient may be greatly relieved. The measures to be adopted are those which subdue inflammation, and obviate or relieve local irritation.

In the first stage, when the membrane of the bladder is merely pushed forward by the commencing enlargement, and before any absolute obstruction to the exit of the urine takes place, bleeding from the loins by cupping, emollient and opiate glysters, and the internal use of Dover's powder (*pulvis ipecacuanhæ et opii*), are the means to be employed. In his first publication, Home recommended the tepid hip-bath at 94° or 95° for fifteen minutes once in the twenty-four hours; but afterwards he expressed his conviction that warm applications are injurious. Perhaps the disease is most safely trusted in this stage to rest, abstinence, or, at least, unstimulating food, occasional bleeding from the loins, or by leeches from the perinæum, and proper attention to the regular evacuation of the bowels. Neither catheter, bougie, nor any other mechanical contrivance should be used so long as the urine is not obstructed. Wine and malt liquors must be entirely abandoned, and spirituous fluids ought never to be tasted. The best laxative medicine, according to Home, is the infusion of senna with the tincture, and soluble tartar, varying in proportion according to the circumstances of the case; and where the first dose of this mixture is insufficient, he is more disposed to repeat it than to have recourse to any other purgative. Notwithstanding this, however, in some cases, other forms of purgative or laxative medicine will agree better with particular individuals, and this is better determined by actual trial. Castor oil, electuary of senna, or either of its modifications, the laxative or the compound electuary of sulphur, are convenient medicines. Calomel is justly prohibited. In other instances, the bowels are most easily emptied by clyster, for which

Home recommends two drachms of powdered aloes to be dissolved in a pint of milk. Pain may be relieved by opiate injections or suppositories. When the urgent symptoms have disappeared, cold washing of the hips or cold bathing will be the best means of improving the general health and healing all local irritation.

When, notwithstanding the diligent use of the means here mentioned, the calls to void water are more frequent and the efforts more violent, the belly must be examined. If the parts are soft and pliant, the treatment by medical remedies is to be continued, and no instrument should be used. But if the parts are tense, and have a regularly circumscribed form like that of the distended bladder, the urine is to be drawn off by the elastic gum catheter, made of the form and curvature recommended by Home.* The details belong to surgery. If circumstances require, the instrument is to be introduced every six or eight hours, or may be retained in the bladder, if it do not irritate. Soon after this treatment is adopted, the internal membrane of the bladder becomes less inflamed, the secretion from the prostate gland diminishes in quantity, and loses the extreme tenacity which it possessed, and all pain and uneasiness subside. These changes, which take place not uncommonly in two or three days, indicate that the urgent swelling of the middle lobe is diminishing or diminished. The time required for it diminishing sufficiently, to allow the water to pass without the instrument, varies in different cases. When relief is given at the beginning, the patient may get well in a few days; in other instances it may be weeks, months, or even years before it subsides much; and, as it is principally a disease of old age, when the vital actions are feeble in patients above eighty the disease may remain stationary during life, without appearing, however, to accelerate the fatal event.

If the disease be not relieved in the manner now mentioned, symptoms of irritation are succeeded by stupor and the usual marks of oppressed brain, and the patient dies partly exhausted, partly comatose. If he survive this, suppuration of a bad and tedious character supervenes, and a precarious and miserable existence is at length terminated by slow but certain hectic.

Chronic prostatic inflammation occurring in strumous subjects is mentioned by Baillie, and described by Mr Lloyd. Either the mucous membrane of the ducts becomes the seat of

* Vol. i. p. 76, &c. and Vol. ii. p. 73, Chap. v. of the form, &c.

inflammation, secreting purulent fluid with scrofulous characters; or, as inflammation spreads over the mucous membrane of the ducts of the gland into their interior extremities, matter is accumulated within them, and distends them more or less; the gland undergoes a slow enlargement, and at various parts is converted into cysts containing the same kind of matter. The matter generally makes its way into the bladder near the commencement of the urethra; sinuses are formed in the gland; the urine trickles into them, and insinuates itself into the contiguous cellular substance; and urinary abscesses and fistulæ of the most disagreeable character and unmanageable nature are formed.

The commencement of this disease, when it is chiefly an object of medical management, is obscure, sometimes unperceived. If its presence could be detected, it is not easy to say what would arrest or subdue the strumous action. Afterwards, when it is indicated by its effects, its management is chiefly to be conducted on the general principles of counteracting strumous influence, while its local peculiarities require surgical treatment.

§. XI. Inflammatory Urethral Stricture.

Before leaving this subject, I think it important to direct the attention of the practitioner to another inflammatory disorder similar in nature, and liable to be mistaken for acute prostatic inflammation. This is what I would name inflammatory stricture, or stricture of the urethra, from acute inflammation attacking a particular part of the canal.

This generally ensues on ordinary stricture, and its presence is indicated by the urine becoming completely suppressed; while the patient, after a fit of shivering or wandering chills, is attacked with quick full pulse, dry skin, much thirst, general uneasiness and painful pricking, most commonly referred to the anus, but sometimes to the urethra. When he attempts to empty the bladder, he feels that he is unable; and as the accumulation and distension increase, his sufferings also increase.

The causes of this inflammatory attack are, in the first place, suppressed gonorrhœa, previous stricture irritated or inflamed, and especially excesses in eating, drinking, and in sexual intercourse.

The disorder should be distinguished from stricture and disease of the prostate gland.

The disease is often attempted to be treated, like stricture, by introducing a bougie or catheter; but these instruments uniformly aggravate the sufferings of the patient and the intensity of the disorder. The most rational and effectual treatment consists in full blood-letting from the arm, followed by local bleeding from the perinæum, evacuating the bowels by castor oil and enemata, the use of the warm-bath, or the hip-bath, or fomentations, and opiates in moderate doses. After one or two full blood-lettings the urine is generally discharged; but if not, the catheter or bougie should be introduced. The tincture of muriate of iron, in doses of twelve or fifteen drops, every hour, is useful as an adjunct.

If not treated by antiphlogistic measures it is in danger of causing inflammation of the bulb of the urethra, the perinæal cellular tissue, and the scrotal pelvic cellular tissue, and that at the top of the thigh; and rupture of the posterior part of the urethra ensuing with extravasation of urine, death takes place by local sloughing and the severity of the constitutional disorder.

§. XII. Inflammation of the Womb and Ovaries. *Metria*. *Metritis*.

Practical Essays on the Management of Pregnancy and Labour, and on the Inflammatory and Febrile Diseases of Lying-in Women. By John Clark, M. D. &c. &c. London, 1793. Sect. ii. p. 62.—*Traité Pratique des Maladies de l'Uterus et de ses annexes, &c.* Par. Mad. Veuve Boivin et Par M. Duges. Paris, 1833. 8vo, deux tomes. Tome ii. Sixième Section, Ch. i. ii. iii. and iv.

A. *Acute Uterine Inflammation*. (*Metria Acuta*.)—Inflammation of the substance of the womb when uncomplicated is tolerably well-marked. It usually begins about the second or third day after delivery, and is first known to exist by a sensation of pain felt at the lower part of the belly, which gradually increases in violence, and is distinguished from after-pains by being constant. The patient complains much if pressure be applied to the region of the womb, which may be felt larger than common, and a good deal harder. Soon after the appearance of these symptoms, marks of constitutional affection take place in increase of heat all over the body; white, dry tongue; thirst; pain in the head; and hard, full, strong pulse, varying from 100 to 120 beats in a minute. The stomach is apt to be affected with sickness and vomiting; there is great pain in the back shooting into the groins; the lochial discharge is much dimi-

nished, sometimes entirely suppressed; and the secretion of milk is generally interrupted. The urine is high-coloured, depositing a pink-coloured sediment, when unmixed with uterine discharges; always scanty; sometimes entirely suppressed in consequence of the disease extending to the neck of the bladder. As the disease advances, slight shiverings take place at various times of the day; the countenance becomes occasionally flushed; the tongue assumes a fiery red or scarlet appearance; the pulse becomes more frequent and weaker; and amidst symptoms of general irritation and extreme restlessness the patient is quickly cut off.

In more favourable cases a flow of fetid lochia relieves the symptoms; the pulse becomes less frequent, the flushings appear more seldom, the tongue becomes paler, and the skin, which before had been hot and dry, becomes moist and cool; spontaneous diarrhoea comes on, and the patient recovers. The chance of recovery is greater where neither shiverings nor flushings of the face occur, where the womb becomes gradually softer and less tender, where the lochial discharge returns in its usual quantity and quality, and the secretion of milk is restored.

In fatal cases the peritonæum is rarely affected generally; but that part which covers the womb may be slightly red and vascular. The Fallopian tubes and ovaries are red and loaded with blood. The womb is firmer in its substance and larger than when naturally contracted. Purulent matter is found in its substance, generally in the large veins of the organ, and sometimes in the cavity of the Fallopian tubes and in the substance of the ovaries, which may thus be distended and as large as a pigeon's egg. Mortification of the womb is mentioned by authors, as an effect or termination of inflammation; but Dr Clarke never observed any thing like this, unless in one case in which the neck (*cervix*) had a gangrenous appearance; and in this instruments had been employed during labour. It is probable that the appearances mentioned as gangrene arose from the remains of traces of bloody clots and serum, at the part of the womb to which the placenta was attached. Softening or putrescence of the womb has been already described as an affection distinct from, and independent of, inflammation. (p. 195.)

A milder form of uterine inflammation is described by Mr Burns. It is distinguished by taking place within the month after delivery, by continuance of the lochial discharge, and the secretion of milk, a train of symptoms in general much milder, but of

longer continuance, and by terminating in a sort of resolution by partial suppuration, or the discharge of a little blood, or the mere return of the usual secretions by the skin, bowels, and kidneys. It is a partial inflammation, and perhaps a subacute one.

Uterine inflammation is to be distinguished from after-pains, puerperal fever, inflammation of the bladder, and from fever with intestinal congestion.

The causes of this disease are sufficiently well understood. Parturition is unquestionably a condition which predisposes to it, and the affection now described is such as occurs in the persons of women recently delivered. It is not improbable, however, that slighter degrees of the same disease may occur in females not parturient or puerperal, and it will not be difficult to perceive how the symptoms in such cases may be modified. In the case of puerperal females, various agents operate as exciting causes. Of this kind are long or tedious labours, violence, either by indiscreet manual efforts, or the use of instruments, especially the lever (*vectis*), exposure to cold, improper management in the article of diet, premature exertion in removal after delivery, and in some instances mental anxiety or despondency.

The treatment may be preventive or remedial. The preventive consists in avoiding or preventing the operation of all those circumstances which tend to induce local congestion or inflammation. Even in mild cases this will generally be sufficient to cure the disease, with the aid of rest, low diet for a day or two, and the use of laxative medicine or emollient injections.

In the more severe forms of the disease, the prompt and energetic use of antiphlogistic measures must be adopted. Bleeding from the system in strong or unbroken constitutions should never be omitted; and much of its success depends on its being performed early. The quantity must be regulated by the constitution of the individual, the violence of the symptoms, and the state of the pulse. In the repetition of the operation the same circumstances, and the effect of the former evacuation as the disease will direct. In some instances in which the symptoms have been relieved without entirely disappearing, the local application of six, ten, or twelve leeches to the hypogastric region, or even to the vulva, followed by sedulous and careful fomentation, will be attended with speedy resolution of the disease. Blisters are rarely useful, and too often irritate. The bowels should be kept open, but purging is to be avoided. Opiates, either alone or

combined with antimony, are very useful in the first form, by removing irritation and promoting sleep, in the second, by rendering the vascular system less active, and the skin more moist and cool. Clarke informs us he found great benefit from a combination of three grains of antimonial powder, the same quantity of rhubarb, and half a grain of opium, which in general had the effect of assuaging pain and securing the regular action of the intestines.

If, notwithstanding the use of such remedies, the symptoms continue little abated, it will be best to wait and trust to the powers of the constitution. If considerable or entire relief do not follow the first attempts to cure the disease, the continuance of them may interrupt the efforts of nature.

If, after the symptoms have continued for several days, shivering attack the patient, suppuration is to be apprehended. If this take place in the Fallopian tubes, it may escape into the cavity of the womb. If it be situate in the substance of the ovaries, the only mode of evacuation is by absorption and metastasis, by breaking into the peritoneal cavity, or by adhesions forming between the ovary and the abdominal parietes and subsequent ulceration. Either case is uncertain. If matter form in the veins of the womb, death is the consequence; and perhaps this is the usual mode in which the disease proves fatal.

Little can be done in those cases which assume all the usual characters of hectic with rapid wasting. Palliative measures may be employed. Nutritious diet, if the patient has appetite, with opium, sarsaparilla, and bark, are almost the only resource which presents itself.

B. Chronic Uterine Inflammation; (Metria Chronica); Hypertrophy of the Womb.—The womb is further liable to become the seat of chronic inflammation, in the course of which its substance becomes slowly but steadily enlarged, its *parietes* thickened, solidified, and very vascular, its density increased, and its consistence sensibly augmented, so as to appear indurated. According to Hooper, its volume may be increased, especially in the body of the organ, without any appearance of the morbid tissue, and consisting only in increase of the natural tissue of the organ. The change in the latter case has been called Hypertrophy of the Womb; in the former, the difference is so slight, that the same denomination might be applied to both. The chief difference is supposed to consist in the circumstance, that hypertrophy may take place independent of the inflammatory process, whereas in-

duration and enlargement are dependent on the inflammatory process.

It perhaps cannot be maintained that hypertrophy cannot exist without inflammation, because it is known that the state of the womb during pregnancy, which is a species of temporary hypertrophy, takes place without the inflammatory process. But, on the other hand, *prolapsus* of the womb, in which the vessels are greatly overloaded, is generally accompanied with hypertrophy; and perhaps every case of *procidencia* is either the effect of some degree of the inflammatory process, or is attended with it.

The chief point is to know that the womb is liable to a species of enlargement, thickening, and not unfrequently induration, which has been confounded with and is liable to be mistaken for *scirrhus*, but which presents not the peculiar tissue characteristic of that heterologous substance. The organ is then considerably increased in weight as well as in bulk, and it is not uncommon for it to be the seat of a whitish opaque, or mucopurulent secretion, which proceeds from its mucous surface and neck.

This chronic inflammation may be general or partial. In the former case it affects the *fundus*, the body, and the neck of the organ at the same time. In the latter it is confined to one part of the organ, most usually the neck, which is then thick, swelled, more or less painful, and much reddened. In some instances the glands of Naboth, viz. the muciparous follicles at the neck of the womb, are enlarged and hypertrophied.

This disorder is to be distinguished from *scirrhus* of the womb, tubercular *carcinoma*, phagedæna, and uterine polypus.

The symptoms of chronic uterine inflammation are not in their early stage well-marked, because too often the disease makes its approach in an insidious and gradual manner. Afterwards, however, it is distinguished by a sense of weight and heat in the hypogastric region; pain and gnawing weariness in the back, which is aggravated to an extreme and excruciating degree by long sitting or the long maintenance of the erect position; pain deep in the pelvis, accompanied with pricking soreness, and not unusually a dragging sense of down-bearing attended with great faintness. These sensations, though at no time wholly absent, become at particular seasons, and under certain circumstances, remarkably intense and even excruciating. Thus sometimes, if the bowels be confined, the expulsion of

hardened excrement causes much suffering. The process of emptying the bladder is always attended with more or less heat, scalding, and soreness. Sexual intercourse is also a sure occasion of aggravation of the symptoms; and very generally, at each menstrual period, they are more or less aggravated, and sometimes accompanied or masked by hysterical symptoms. In general, also, the symptoms are aggravated by walking, dancing, or long standing on the legs; and this aggravation is always more intense in proportion as the enlarged womb is more bulky and heavy, because it seems to be principally by its weight in drawing down the organ and stretching the ligaments, that several of the uneasy feelings are occasioned.

Several changes in the state of the menstrual function are also observed, and should be noticed. Menstruation is usually deranged, sometimes suppressed or diminished, often irregular in its appearance; so that, occasionally, hemorrhages take place; and, in some instances, one of the earliest manifest signs of chronic *metritis* is said to be, after suspension of the menstrual secretion for one or two, or more periods, hemorrhage, which is suspected to be a token of threatened miscarriage. While the menstrual secretion is suspended, a serous discharge is observed to take place and increase gradually, becoming sero-mucous or mucous, and at the time of the hemorrhage coming on, it is generally tinged with blood.

When more or fewer of these symptoms are present, it is requisite to examine not only the hypogastric region, but the state of the womb and its neck *per vaginam*. In some instances it is possible, by examining carefully the hypogastric region, to feel a considerable increase of size in the womb, in the shape of firm, resisting, and painful tumour. The presence and extent of the disorder is, however, rendered merely probable by these proceedings; and to ascertain its existence, it is requisite to examine *per vaginam*.

The lips of the *os uteri* are then found thicker, rounder, and more elongated than usual; while the orifice itself appears often more hollowed or infundibuliform. The consistence of the neck and *os uteri* varies; but it is always greater than natural; it is painful when touched and, in general, somewhat hotter than natural, and has a tense firm feeling. These changes in the sensation and size of the orifice and *cervix*, may be confined almost exclusively to the *cervix uteri*. In other instances they extend

to the body of the organ, or to one side of its body, and to the ovary and Fallopian tube of that side. When the enlargement affects the whole body and the *fundus* of the *uterus*, it is requisite to combine hypogastric palpation with vaginal examination; and, in that case, it is possible to recognize the presence of disease by these two methods, viz. by fixing the womb by the finger in the vagina, while pressure is made from the hypogastric region. Examination *per rectum* is at the same time proper, to ascertain the state of the posterior wall and body of the womb.

Of late years, the employment of the speculum has been added to the diagnostic means used to ascertain the presence and extent of uterine chronic inflammation and hypertrophy. It is certainly useful in obtaining correct ideas on the actual state of the *os uteri*, as to its firmness, its elongation, its colour, and the fact of abrasion or ulceration of the lips of the *os uteri*; but it is of no more use than the hand and finger in recognizing the existence and extent of disease of the body or fundus of the organ. When the orifice of the inflamed womb is examined by this instrument, the mucous surface is generally found much reddened, covered with viscid puriform mucus and blood, and when these are removed, not unusually the orifice is observed to be irregular and unequally swelled, and marked here and there with slight excoriations or abrasions.

ETIOLOGY.—The causes of chronic *metritis*, so far as they are known, are much the same as those of the acute disorder; and sometimes it is the consequence of the latter being imperfectly cured. It may follow a delivery conducted under very favourable circumstances, and with due attention to all necessary precautions. Sometimes it seems to follow repeated miscarriages; sometimes tedious labours; sometimes uterine hemorrhage; but in all these cases, it is to be feared that some degree of the disorder had been already established. The most common way in which it is produced among the lower and working classes, is when females return too early after parturition to the erect posture and their usual occupations and labours.

PROGNOSIS.—Chronic inflammation of the womb is always a formidable, unmanageable, and tedious disorder. Sometimes it seems to undergo temporary ameliorations, while the discharge ceases, and the painful sensations subside under the employment of suitable therapeutic measures. But all the symptoms re-

cur, and as the discharge increases, and the sense of pain and weight continue, the health of the patient is undermined; her strength is impaired; and she is either an invalid for life, or is speedily destroyed by its effects on her constitution. It is liable even to terminate in suppuration or abscess, not unfrequently with bad ulceration. There is reason to fear also that it terminates sometimes in phagedenic ulceration of the *os uteri*, and sometimes in scirrhus.

It is uncertain whether, after much enlargement has taken place, resolution is effected and the womb reduced to its natural size. But as some practitioners have believed that this result has taken place, it is always desirable to attempt it by the employment of proper remedies.

THERAPEUTICS.—The first indication in the treatment of chronic uterine inflammation is to change, as far as may be practicable, an unfavourable state of the constitution. Without attaching much importance to tonics and remedies conceived to possess some antistrumous power, it is certain that residence in the country, with the enjoyment of pure air, the observance of early and regular hours, moderate diet, with regularity in the time of the meals, and warm clothing, especially flannel underclothing, tend much to facilitate recovery, and if it take place, to render it permanent.

Under the same head may be classed the occasional use of purgative or laxative medicine, not to the extent of *catharsis*, but merely to keep the bowels, and especially the rectum, free from load or irritation. The healthy state of the circulation of the womb is so intimately connected with that of the rectum, that, if the latter be disordered, the former cannot be healthy; and if the former organ be unsound, any derangement in the circulation of the rectum will not fail to aggravate the derangement in the womb. When the rectum is loaded, or if it be not regularly and periodically evacuated, the circulation in its vessels is retarded and interrupted, and finally much disordered. Its veins become unduly congested with stagnant blood; and this unnatural state of its vessels exercises an unfavourable influence on the circulation of the womb. The mechanical pressure also of excrement in the rectum is injurious to the womb. For these reasons it becomes indispensable to see, that the rectum is regularly and periodically evacuated in the treatment of females labouring under symptoms of enlarged or hypertrophied uterus.

If this cannot be done by means of dietetic precautions, aided by gentle laxatives occasionally, the best plan is to administer emollient *enemata* as often as the circumstances and habits of the patient require.

The next indication is to endeavour to reduce the size of the enlarged *uterus* by means of evacuating agents. General depletion is rarely admissible; but if the pulse be full and strong, and the patient complain much of pain and weight in the hypogastric region, with scalding and strangury, it may be advisable to detract fifteen or eighteen ounces of blood from the arm. The appropriate method of depletion, however, for the fulfilment of the indication specified, is by local depletion from the orifice and neck of the womb by means of leeches introduced within the vagina. Four or six leeches applied in this manner, withdraw, in a short time, a large quantity of blood; and almost uniformly the evacuation is followed by sensible abatement of pain, diminution of heat and swelling, and evident mitigation or disappearance of all the other symptoms. This mode of depletion it may be requisite to put in practice several times, however, before the symptoms entirely recede. They are always liable to recur at certain intervals, especially at or near the menstrual periods; and the best plan is to apply leeches once a-week or once a fortnight, until alleviation of all the symptoms become evident.

Sometimes it is requisite to draw blood from the back and sacrum by cupping, in order to alleviate the pain referred to these regions. In other instances it is expedient to apply leeches to the groins, to the external parts, and to the anus, all with the view of diminishing pain and uneasiness, and weight or fulness. But the most effectual method is that by the introduction of leeches within the vagina.

It is desirable at the same time, in some instances, to diminish the allowance of food at meals; and some practitioners have recommended the employment of very low diet, or the treatment by starvation (*cura famis*). There is no doubt that, in many cases of uterine chronic inflammation, it is beneficial, if not requisite, to diminish very much the allowance of food at meals; and it is impossible to expect much amendment while the vascular system is distended by the incessant additions to it by the stomach. But it is often difficult to carry this principle into practice; and therefore it is better to employ such medicinal

agents as may most easily contribute to the same end. With this view, minute doses of ipecacuan, as recommended by Dr Gooch, may be administered for a time; and in other cases it is expedient to employ tartrate of antimony, either in doses of one-fourth or one-sixth of a grain, three or four times daily, or doses of two or three grains twice or three times daily.

A multitude of other remedies has been recommended in the treatment of this disorder. Thus many have commended calomel and other mercurial medicines, as blue pill,—and sarsaparilla. Others have more recently recommended iodine and the ioduret of mercury as very efficient remedies. The warm bath, the cold bath, and mineral waters have all been recommended, but on no very distinct indication; in short, all the measures usually prescribed in cases of uterine catarrh, which is a common symptom of the disorder, have been used by different practitioners.

It may be observed, however, that no therapeutic measure will prove efficacious which does not fulfil, in some degree, one of the two indications now specified; and the long list of remedial measures stated in books to have been used with various degrees of success, only shows that they had been employed without due attention to the correct diagnosis of the disorder, and in a method altogether empirical.

The influence of revellent and derivative agents (*remedia exutoria*), or those which are believed to act by counter-irritation, has been questioned by Boivin and Dugés. It was long a custom to apply a caustic or the cautery to one of the thighs or both; and sometimes the application appeared to be followed by beneficial results. When more active revulsion was desired, it was recommended to apply the caustic or cautery or the moxa to the loins, or on the sacrum, or to introduce there a seton. In some instances, benefit resulted, in others none ensued upon the use of these agents; and the disease proceeded unabated, and without being retarded in progress. The truth is, that too often the disease was allowed to proceed too far, before these or any other remedies were put in force; and hence the physician had to contend against the morbid products and organic changes induced by long-continued diseased action. To be efficient, these, like all other remedies, ought to be employed at an early stage of the disorder.

Though the principles of rational pathology require the at-

tention to be directed chiefly to the indications already mentioned, yet the sufferings of the patient, and various uneasy or painful feelings, suggest the employment of remedies intended to fulfil a third indication, viz. the mitigation of pain. It is true, that this is most completely effected, by the use of those therapeutic agents which are most directly effectual in abating and removing inflammatory action; but it is not less true, that some benefit may be also afforded by the judicious employment of those sedative and narcotic agents which assuage the acuteness and allay the irritation of pain. In all cases of chronic uterine inflammation, pain becomes occasionally so severe, that it is often requisite to attempt its alleviation in this manner. Opium, or any of its preparations, extract of hemlock, or henbane, have all been administered with this intention. The first, either in the form of the thebaic or the opium pill, or its representative in the form of sedative liquor, acetate of morphia, or muriate of morphia, may be given in suitable doses, either at bed-time, or any other period when pain is urgent. It is much more efficient in assuaging pain, and less likely to cause thirst and heat, if administered in the form of suppository than when given by the stomach. In this instance, about four or five grains of opium in powder require to be given. Hemlock extract (*Extractum Conii maculati*), and extract of henbane (*Ext. Hyoscyami Nigri*), have also been employed in the same manner. They are useful in cases in which opium disagrees; but they are much less efficient in assuaging pain and allaying irritation.

Local applications have been suggested and employed by many practitioners. Thus, infusions or decoctions of the leaves or roots of various mucilaginous and anodyne plants have been employed by different practitioners with different degrees of success. A common one on the Continent is decoction of mallow (*Malva sylvestris* or *Malva rotundifolia*), decoction of leaves and root of marsh mallow (*Althæa officinalis*); and the decoction of poppy heads (*Decoctum Capsularum Papaveris*) may be used with equal benefit. Many years ago the decoction of the marigold leaves (*Calendula officinalis*) was proposed as a good remedy in uterine disorders; but it has not come into general use. Perhaps a weak watery solution of opium would answer as well as any other application.

Chloride of lime I have tried, in order to correct the fœtor of

the discharge ; but I found it produced so much smarting, that it was impossible for the patients to persevere in its use.

Lastly, as the enlarged organ, from its augmented weight, is liable in the erect position to be protruded, it is requisite, in order to guard against this accident, to confine the patient to the horizontal position, and chiefly the supine position.

When *prolapsus* has taken place, the use of mechanical measures, as pessaries, are recommended. These bodies, however, invariably aggravate the utero-vaginal irritation and inflammation, and increase the discharge, and in process of time they become insupportable, and constitute as great an evil almost as the disorder itself. If mechanical measures of this kind be employed at all, they should be of the kind to cause as little irritation as possible. Of this kind are a small portion of the intestine of an animal inflated and introduced within the vagina ; or a cylindrical bottle of caoutchouc, so constructed as to maintain an equable and gentle distension. A convenient means would be a small bladder of elastic gum cloth inflated to a sufficient degree to afford the requisite degree of pressure. Lately, Dr Hull has proposed a contrivance, to which he gives the name of utero-abdominal supporter, which seems well calculated to afford support with as little irritation as possible, and which deserves a trial in the treatment of *prolapsus* and *procidentia uteri*.

INFLAMMATION OF THE FIBROUS MEMBRANES AND FIBRO-SEROUS MEMBRANES.

§. XII. Rheumatism. Rheumatic Fever. Rheumatic Pains. *Rheumatismus*, Boerh. 1490. Junck. 19. Sauv. gen. 185. Lin. 62. Vog. 138. *Dolores rheumatici et arthritici*, Hoffm. ii. 317. *Myositis*, Sag. gen. 301. Acute Rheumatism, Cullen, Fowler, &c. Rheumatic Fever, Haygarth. *Rheumatismus acutus*, Sauv. sp. 1. *Rheumatismus vulgaris*, Sauv. sp. 2. Rheumatic Headach (*Cephalalgia*), and Neckach ; Crick in the Neck (*Torticollis*). Rheumatic Faceach (*Prosopalgia*), and Rheumatism of the Face, Teeth, and Jaws. The Bastard Pleurisy, or Rheumatism in the Muscles of the Thorax (*Pleurodynia*). *Pleurodyne rheumatica*, Sauv. gen. 148, sp. 3. *Pleuritis Spuria*, Boerh. 878. The Lumbago, or Rheumatism in the Muscles of the Loins. *Lumbago rheumatica*, Sauv. gen. 212. Sag. p. 1. *Nephralgia*

rheumatica, Sauv. sp. 4. The Sciatica, *Ischias*, or Hip-Gout. *Ischias rheumaticum*, Sauv. 213, sp. 10.

Thomae Sydenhami Opera. Editio Tertia. Londini, 1705. Cap. v.—Cases in the Acute Rheumatism and the Gout, with cursory Remarks and the Method of Treatment. By Thomas Dawson, M.D. The fifth edition with considerable additions. London, 1781. 8vo, pp. 227. Appendix, pp. 60.—Maximiliani Stoll, Med. Clin. P. P. O. in Universitate Vindobonensi. Pars Quinta, Rationis Medendi, Viennæ. Aust. 1789. 8vo, (Sect. iii., *Febris Rheumatica*). Sectio Quinta. Annotationes in Febrem Rheumaticam et Arthritidem.—Medical Reports of the effects of Blood-letting, Sudorifics, and Blistering, in the cure of Acute and Chronic Rheumatism. By Thomas Fowler, M.D., &c. Lond. 1795.—On Rheumatism and Gout; a Letter addressed to Sir G. Baker, Bart. By John Latham, M.D., &c. Lond. 1796. 8vo, pp. 80.—A Clinical History of Diseases. Part I. Being, I. A Clinical History of the Acute Rheumatism; 2. A Clinical History of Nodosity of the Joints. By John Haygarth, M.D. Bath and Lond. 1805.—Medical Reports of Cases and Experiments, &c. By Samuel Argent Bardsley, M.D., &c. Lond. 1807. Part 1. of Chronic Rheumatism.—An Account of a peculiar Disease of the Heart. By David Dundas, Esq. Sergeant-Surgeon, Read 1808. Medico-Chirurg. Vol. i. p. 37. London, 1809.—On Rheumatism of the Heart. By William Charles Wells, M.D., &c. Read, 1810. Transactions of a Society, &c. Vol. iii. pp. 373. London, 1812.—An Account of a new mode of Treatment in Chronic Rheumatism, and especially in Sciatica, communicated by Alex. Marcet, M. D., &c. Read 1812. Medico-Chirurgical Transact. Vol. iii. London, 1812.—On the Discrimination of Chronic Rheumatism, from Gout, Acute Rheumatism, Sero-phula, Nodosity, White Swelling, and other painful Diseases of the Joints and Muscles. By John Haygarth, M.D., &c. Read 1812. Medical Transactions. London, 1813. Vol. iv. p. 294.—An Account of the means by which Admiral Henry has cured the Rheumatism, a tendency to Gout, the Tic Douloureux, the Cramp, and other Disorders, &c.; with engravings of the instruments employed. London, 1816. 8vo, pp. 20.—A Case of Chronic Rheumatic Inflammation successfully treated by Bandages. By Richard Grattan, M. D. Read, 1817. Transactions of the Association, &c. Vol. i. p. 167. Dublin, 1817.—Observations on Acute Rheumatism and its Metastasis to the Heart. By Thomas Cox, M.D. London, 1824. 8vo, pp. 65.—Des Maladies Rheumatoides. Par L. A. Gosse, M.D. Geneve et Paris, 1826. 8vo, pp. 505. Not sufficiently definite.—A Treatise on the Nature and Cure of Rheumatism, with Observations on Rheumatic Neuralgia, and on Spasmodic Neuralgia or Tic Douloureux. By Charles Scudamore, M.D., F.R.S., &c. London, 1827. 8vo, pp. 589.—Leçons de Clinique Medicale Faites a l'Hotel Dieu de Paris. Par le Professeur A. F. Chomel. Recueillies et Publiées, par A. P. Requin, D.M.P. Tome Second (Rhumatisme et Goutte.) Paris, 1837. 8vo, pp. 524.

RHEUMATISM is a common name for many aches and pains which, though arising from different causes, have received no peculiar appellation. It is in some instances not easily distinguished from others which have a distinct character. I shall attempt to show that the disease, to which I restrict the name of rheumatism, consists in inflammation, acute, subacute, or chronic, of certain divisions of the fibrous system, or the tendinous sheaths and aponeurotic membranes.

SEMIOGRAPHY.—Rheumatism has by different authors been distinguished into a considerable number of forms, species, and varieties; some of these distinctions being founded on the nature of the remote or exciting cause; some on the nature of the parts or texture affected; and some on a state of the human body, supposed to exist, or actually existing, at the time. The most convenient distinction for practical purposes is that into Acute Rheumatism, Subacute Rheumatism, and Chronic Rheumatism.

A. Acute Rheumatism, or what is usually designated as Rheumatic Fever, comes on in general with chilly fits, or sensations of cold, or a fit of distinct shivering, succeeded by unusual heat, quick pulse, thirst, loss of appetite, and more or less loss of strength. Either along with these symptoms, or very soon after, the patient complains of pains of various degrees of acuteness and severity in various parts of the body, very generally impeding motion, and greatly aggravated by motion. The seat of these pains is various. In some instances they are confined to the large joints; in others they are referred to muscular parts; in some cases they affect both the larger joints and muscular parts at the same time or in rapid succession; and in some very severe cases they affect the trunk and limbs so generally, that the individual is pinioned motionless to one position, and is quite unable to make use of any muscle or limb; partly from extreme pain, and afterwards from want of power. These pains, though at all times very severe, become excruciating at certain times, especially during the night, and almost invariably interrupt sleep. The pains are described as assuming various forms; fixed or wandering; tense or pricking, lancinating, girding, burning and tearing.

In acute rheumatism or rheumatic fever, not only are the pains very severe, but all the functions are disordered. The pulse is generally more rapid than natural. In frequency it is generally from 84 to 107; in a smaller number of cases it is between 108 and 130; and in five cases out of 93 it was below 72. (Haygarth.) Chills also are not uncommon, either alternating or alone.

The blood is always covered with a thick, firm, buffy crust, and is often very much cupped or contracted from the circumference to the centre.

The urine is scanty and high-coloured at the commencement

of the disorder, and is at the same time extremely acid ; but afterwards it deposits a copious brownish red sediment like brick-dust. (Haygarth.)

The skin is generally dry during the day and the early part of the night, when it is also hot, while the severity of the pains is great. Towards morning the pains undergo some remission in severity, and the skin at the same time becomes moist, and in some instances sweating is most profuse, bathing the surface in an unctuous fluid, emitting a peculiar odour, yet without affording any permanent alleviation to the pain. As the patient is generally disposed to keep himself warm in this state, the skin is not unusually covered in various parts with a miliary eruption ; and the eruption is more likely to take place where opiates and other heating diaphoretics are administered, than where an opposite or less heating method of treatment has been pursued.

The tongue is generally covered with a thick whitish crust, or presents a rough gray coating, and the patient complains of thirst especially during the night. The appetite is not invariably impaired, for sometimes patients continue to take food, though simple aliment is rejected. The bowels are in the majority of cases confined ; though in a few they may be loose ; and whenever they seem to be loose, the frequent motions are observed to arise from a previously constipated and neglected state of the intestinal tube.

Along with pain of the surface, especially if the disease be seated over the larger joints, redness and heat are sometimes observed. The redness is superficial and appears in the character of *erythema*, that is a mere superficial blush not tending to vesication or desquamation, and slightly disappearing on pressure. The pain is always an acute rheumatism, aggravated by pressure, and sometimes it is so severe that the weight of the clothes cannot be endured.

The symptoms now specified may last for several days, or two weeks, varying in severity ; but, in general, either spontaneously or in consequence of treatment, they undergo at the end of eight or ten days, or two weeks, some mitigation in their intensity. The patient no longer suffers acute pain at all periods, nor in so many parts of the body ; but feels them chiefly when he attempts to move, or during the night. He is in general, however, extremely helpless, and seems not only to dread motion, but to be unable to move various parts of the body, from

a feeling of incapacity to exert the muscles with any energy or power. At the same time, the pulse is less frequent than at first, and he suffers less heat, feverishness, and thirst; but the skin continues still to be moistened with unctuous, uncritical, and enfeebling sweatings; and the urine, though more abundant than at first, is still scanty, and generally turbid, at least on cooling, and deposits a brick-dust sediment. The tongue also is furred, and the appetite not good. In this state the acute form of the disorder throws aside its most characteristic symptoms, and gradually passes into the subacute form, or may eventually assume the chronic character.

B. The disease may, in the *second* place, appear from the first in the subacute form. This may be known by the patient complaining, in general, at first of pains in various parts of the head, trunk, or extremities, without any of the symptoms of well-marked febrile disorder, as shivering or chills, with which the attack of the acute form of the disorder is commenced. These pains are felt at first in one limb, or one joint of one limb, and then in another limb, or in two or more joints of the same limb; or they may be felt in the same or analogous joints of different limbs. For instance, they may attack the knee and ankle in one leg, or both ankles, or both elbows, or both wrist-joints. In some cases, these pains are observed to pass from one joint to another, affecting different articulations in rapid succession, as in acute rheumatism; but in other cases, they fix on a leg or an arm, or part of the trunk, as the occipital, or the cervical, or the dorso-lumbar region; and in these they remain for some time, without evincing any tendency to pass to others.

In whatever mode they appear and prevail, they are never accompanied with the intense febrile disorder observed in the acute form of the disease; and, indeed, it is chiefly by this circumstance, and their less general extension over the whole frame, as well as their greater mildness, that it becomes requisite to admit a subacute form of the disorder. The pulse is often not above 70 or 72, rarely more than 80 or 86, and it varies between 70 and 92 for some time. In the night, and when the patient becomes warm in bed, it is generally between 80 and 90; but during the day it is often not above 86, as already stated; and in some cases it does not exceed 72. Yet with this moderate rate of the cardiac beats, other marks of febrile disorder may be recognized.

The tongue is more or less covered with a whitish viscid, sometimes rough fur. The patient is rather thirsty, especially during the night, and the tongue and mouth are felt and observed to be dry in the morning. The skin is dry, and either unusually cold in some parts, or unusually hot; and is generally covered with moisture, either when the patient is warm in bed or asleep. These cutaneous discharges are not critical, and instead of alleviating the symptoms, they often tend to aggravate them. When the patient is thus warmed, and the surface covered by them, the slightest currents of air blowing on him, are followed by aggravated severity of the pain and stiffness of the joints, or by the addition of new pains in parts hitherto unaffected.

The urine also is always much altered in quantity and quality, and indeed the change in that secretion is the most constant in subacute rheumatism. It is scanty, denser than natural, and high-coloured, and generally affects litmus paper instantaneously and deeply. But is rarely so scanty as in the acute form of the disease; and it may be almost as abundant in quantity as in health, but is still high-coloured, and deposits on cooling a sediment, which in some instances is pink-coloured, in others of the brick-dust aspect.

When blood is drawn, it is always covered with a buffy coat more or less thick, and very often it is cupped or contracted from the circumference to the centre of the clot. Sometimes after blood-letting the pulse becomes more frequent, viz. rising from 70 to 86, or 90 or 92.

The bowels are always much constipated, and in some sense torpid, that is not easily moved by means of medicine; and if careful inquiry be made, it will be found that, for a long time previous to the attack of articular pains, the bowels had been slow, not often or regularly moved, and never moved unless by means of medicine. The patient at the same time not uncommonly complains of a bad taste and viscid feeling in the mouth, loathes food (*anorexia*), more or less completely, and has feelings of distension in the epigastric region after eating, with acid eructations and heart-burn (*cardialgia*), or *gastrodynia*.

Though the pains are less severe, and less disable the patient than in the acute form of the disorder, yet they are often more enduring, and less readily removed. It is not easy to say whether this depends on the fact, that the patients do not so

early apply for assistance or employ means of relief, and frequently move about with tolerable ease during the day, while the night is almost altogether sleepless, for several weeks, until the disease is either aggravated into an acute attack, or begins to pass into the chronic state.

It is not constantly accompanied with swelling or enlargement of the affected parts. But sometimes the surface is reddened; and sometimes it is rather hot, while the patient complains that it is cold and stiff.

While acute rheumatism affects several joints and parts of the frame simultaneously or in rapid succession, it is rather the character of the subacute form to affect one or at most two parts, and sometimes it confines itself almost solely to these regions during the whole course of the disorder. Hence practitioners have distinguished rheumatic attacks according to the regions affected; and this distinction is applicable either to the subacute or the chronic form of the disorder.

Without adverting to all the distinctions made which has been a febrile source of confusion with other painful complaints, I shall enumerate the following as the principal requiring notice, chiefly as convenient means of specifying the seats and usual phenomena of the disorder.

a. Epicranial Rheumatism, Rheumatism of the Head. (Cephalalgia Rheumatica; Cephalodynia.)—In this the rheumatic pains are referred chiefly to some part of the head, most commonly the occipital region, the mastoid processes, less frequently the frontal and temporal regions. I shall show that the disease is seated in this case in the epicranial aponeurosis.

b. Cervical Rheumatism. (Auchenodynia.) Rheumatism of the neck. Crick in the neck; (Torticollis.)—In this variety the pain affects chiefly the back of the neck, which is sore, stiff, and incapable of motion, without more or less considerable pain. It is not unfrequently associated with epicranial rheumatism. The pains are seated in the cervical fascia.

c. Facial Rheumatism and Facio-temporal Rheumatism. Prosopo-crotaphite Rheumatism.—These two may be placed together, because either the pains pass from the face to the temples, or conversely, or the pains affect both at the same time. This form of rheumatism must not be confounded with nervous face-ach, (*Prosopalgia, Neuralgia facialis*), or tic-douloureux. Often it alternates with toothach, and is sometimes mistaken for it.

d. Rheumatism of the Eye.—Rheumatic ophthalmia is a very painful and excruciating form of the disorder, seated in the sclerotic coat. (See Dr Curry's history of his own case, *Medico-Chirurg. Trans.* iii. p. 348.)

e. Rheumatism of the Sides and Chest, Rheumatism of the intercostal muscles. (*Pleurodyne; Pleurodynia.*) *Spurious or Bastard Pleurisy.*—This consists in rheumatic pains of the aponeurotic investments and slips of the intercostal muscles. It is chiefly important from its liability to be confounded with pleurisy. It is sometimes absurdly named *pleuritis rheumatica*.

f. Diaphragmatic Rheumatism.—A most painful and often alarming form of the disorder very liable to be mistaken for pleurisy, pneumonia, or pericarditis; and it may pass to the former or even into pericardial inflammation.

g. Dorsal and Dorso-lumbar Rheumatism. Lumbago.—This is a very painful and disabling form of the disorder, preventing the patient from walking erect, sometimes making him stoop forward, sometimes drawing him backwards. It is seated in the dorso-lumbar aponeurosis. This must be distinguished from inflammation of the psoas muscle and lumbar abscess.

h. Ischio-gluteal Rheumatism. Ischias. Rheumatism of the Hip. Hip-Gout.—Rheumatic pains affecting the gluteal aponeurosis, the ischial aponeurosis, and sometimes extending to the ischiatic nerve. The latter, however, ought to be regarded as a species of neuralgia.

ETIOLOGY.—*a.* The *season* during which it is most prevalent is, according to Fowler, (p. 260,) the months of January, February, and March, and according to Haygarth (p. 22), December, January, February, March, and April. But it may be observed that its comparative prevalence during any given month or season will depend much on the kind of weather most general at the time. Haygarth makes the cold season more liable to acute rheumatism than the warm, in the ratio of seven to five; but admits that no part of the year is exempt from its attacks.

In the epidemics described by Stoll, it appears that, during the years 1776, 1777-78, and 1779, this physician saw rheumatism prevail chiefly during the months of April, May, and June. It was less frequent during autumn, still less so in the winter season, and rarely appeared in the summer. From the Reports of Willan on the Diseases in London in 1798, it appears to have been most prevalent during the period from the begin-

ning of March to the end of June, especially the latter period. (Reports, p. 260. London, 1821.) According to Chomel, among 58 cases observed at La Charité, 24 were for the first time attacked with rheumatism during the winter, 18 during autumn, 12 during summer, and only 4 in the spring. He allows, however, that in autumn 1812 and winter of 1813, he collected the greatest number of cases; and that the facts would require to be collected during a certain number of years, in order to select from many different circumstances what really depends on the seasons.

In the Royal Infirmary of Edinburgh, the cases of acute rheumatism are most prevalent in the months of April, May, and June. A few cases of the subacute and chronic forms of the disorder are admitted in the course of the winter; but if the history of these be carefully investigated, it is found that they originated in the previous summer, that the patients either applied to a dispensary or a medical practitioner, and underwent some treatment, or employed remedies on their own counsel. During the last season (1839,) the numbers of rheumatic cases, both acute and subacute, have been very considerable, especially during the months of May, June, and July; and even in private practice subacute rheumatism has been a common complaint. The most generally prevalent forms of the disease, it may be further observed, have been the occipito-cervical (*Cephalodynia*; *Auchenyndia*), the dorso-lumbar (*Lumbago*), and that affecting the upper extremities.

b. The Influence of Cold.—Haygarth has been at great pains to ascertain the various forms in which the operation of cold or moisture may be followed by rheumatism; and he has enumerated not fewer than 23, which, however, may be all reduced to the following general heads. The disease is ascribed, 1st, to cold applied when the body is unusually warm, as exposure to cold air when sweating, or sitting in a current of cold air after walking to excite sweating, to dancing, to walking in the fields after dancing, to a damp bed after dancing; 2d, to exposure to cold in the form of moisture; as cold water poured on the head, shoulders and breast; being wetted to the skin once or twice with rain, or sleet, or snow; to wet feet, to wading in the river a shorter or longer time; to a damp bed, a damp room, a damp house, or a damp shirt; 3d, to long exposure to cold, with or without moisture, as lying on the ground, travelling in hard-frost, or in frost and snow, and

changing from worsted to cotton stockings. (Haygarth's Clinical History, pp. 24 and 25.) In all instances of this nature the cold is applied when the system is unusually heated, and is applied suddenly; and, if particular attention be paid to the circumstances under which the human frame is exposed to cold, and then becomes affected with rheumatism, it will be found that in general it is in that state in which the system is either overheated or the skin is perspiring.

From the circumstance now mentioned of the influence of cold, it results that many persons date their first attack of the disease to the period of sleep, especially if they have happened to sleep in the open air, or in a chamber with a window open or exposed to a current of air, or a stream of water or snow, (Dr Curry's case), or in a bed with damp or imperfectly dried bed-clothes. Hence, also, it results that particular professions and occupations are more exposed than others; for instance draymen, cart-drivers, or coach-drivers, day-labourers, cordwainers, and bakers, than those belonging to other occupations. In the exposed life and laborious duties of the soldier, rheumatism might be imagined to perform a conspicuous part; and, in point of fact, in some cold and exposed campaigns as in that of Russia, according to Kerckhove, attacks of rheumatism were frequent. But it is remarkable, nevertheless, that it is not a very common disease in the ordinary circumstances of military service. It is indeed often simulated; but it is not very frequently a genuine disorder of the soldier.

c. Climate.—Rheumatism is said not to be the disease of either very cold or very warm countries. The only mode of deciding this point, is by referring to its prevalence among large bodies of men stationed within the tropics, compared with those stationed in colder latitudes. In the Statistical Report on the sickness, mortality, and invaliding of the troops in the West Indies, it appears that the prevalence of rheumatic disorders in the Windward and Leeward Command is represented by the ratio of 49 per 1000, or nearly 5 per cent. and in Jamaica by 29 per 1000, or nearly 3 per cent. Among the troops stationed in the united kingdom, the prevalence of rheumatic disorders is represented by 50 per 1000, or 5 per cent. exactly. Among the troops stationed in Gibraltar, the admissions for rheumatic disorders amount to 38 per 1000, or $3\frac{4}{5}$ per cent.; among those in Malta, they are 34 per 1000, or $3\frac{2}{3}$ per cent.; and among those in the Ionian Islands, in general, the ratio of admissions for

rheumatic disorders is $34\frac{1}{2}$ per 1000, or nearly the same as in Malta. In Nova Scotia and New Brunswick, possessing a climate distinguished for vicissitudes, a humid cold atmosphere, and winters of great severity, the admissions for rheumatic disorders amount to 30 per 1000, or 3 per cent. At the Cape of Good Hope the admissions are 57 per 1000; at Mauritius, 46; and in Canada, 40 per 1000. If we convert these numerical statements into legible conclusions, they give the following results. The climate most productive among all those examined is that of the Cape of Good Hope, that colony being at the head of the list, (57); the next are Great Britain (50), and the Windward and Leeward Station, (49); the next in succession are Mauritius, (46), Canada, (40), and Gibraltar, (38); then the Ionian Islands, ($34\frac{1}{2}$); and Malta, (34); then follow Nova Scotia and New Brunswick, (30); and last and least of all is Jamaica. It seems difficult to say, whether a variable climate or a variable and cold climate like that of Nova Scotia, is most productive of rheumatic disorders.

d. Age.—Chomel informs us, that, among 73 patients admitted into the Hôpital de la Charité, 35 were attacked for the first time with rheumatism between the ages of 15 and 30; 20 between 30 and 45; 7 between 45 and 60; and the same number after the 60th year. Two only had the disease before the age of 15; one at the age of eight, the other at that of nine years.

e. Sex.—On the subject of the prevalence among the two sexes, various vague opinions, but no precise facts, are given by authors. Hoffmann thought that he found females more exposed to the disease than men. Van Swieten, on the other hand, states, that men, being more exposed to laborious occupations in the open air, to errors in regimen, and the severities of warfare, are, therefore, more exposed to these disorders than females.

According to the observations of Fowler, it is most common in persons of both sexes between the ages of 10 and 30, and rather affects females than males subsequently, in the proportion of 46 to 41. Haygarth, again, though he admits that it attacks all ages between 5 and 60, and more commonly between 5 and 30, represents the disease to be more common from 15 to 20 years, and to affect males more frequently than females, in the proportion of 98 to 73, or 4 to 3 nearly. Chomel is inclined, from observing the admissions at Salpetriere, to prefer the opinion of Van Swieten to that of Hoffmann.

The truth is, that much of the comparative prevalence of

rheumatism among the two sexes depends on the rank of life, and the nature of the occupations. Rheumatic disorders are much more prevalent among domestic female servants and other women engaged in laborious duties, in which they are often exposed to atmospheric vicissitudes, than among females not so exposed. Among the domestic servants admitted in the Royal Infirmary for treatment, a considerable number labour under various rheumatic disorders.

Peculiar Diathesis ; Bilioid influence.—As all the previously specified circumstances are not in all cases sufficient to explain the occurrence of rheumatic disorders, which are observed sometimes to follow the application of these causes, and sometimes not,—while the operation of these causes is observed to be followed by other disorders ; hence some physicians have inferred the existence of a particular state of the system, which they have believed to be favourable to the developement of rheumatic symptoms. This state has been properly termed the predisposition to rheumatism, and by some the rheumatic diathesis ; (*Diathesis rheumatica*). In what this consists has not been very clearly specified. One of the most obvious to observation is more or less derangement in the functions of the alimentary canal and the liver. Stoll remarked the great influence of bilious symptoms in rheumatism ; and he therefore distinguished rheumatism into inflammatory rheumatism, bilious rheumatism, catarrhal rheumatism, and some others less admissible. It may perhaps be doubted, whether there is ever a case of rheumatic disorder, especially of the subacute form, in which there are not symptoms of disorder in the circulation and secretions of the liver and alimentary canal. The bowels are slow and inert ; the tongue furred, with a bad taste in the mouth ; the countenance is often dingy, and the conjunctiva yellow ; and there are always symptoms of slow and imperfect circulation through the liver. This condition of the alimentary canal and the hepatic circulation gives rise to a perverted or deranged condition of the sanguiferous system in general, and the skin in particular. It may be doubted whether it be actual plethora, that is fulness of the vascular system. But the skin in this state never perspires freely and uniformly, loses its energy, and in order to compensate for this imperfect action in general, it is liable to become inordinately heated, and to perspire profusely during the night and towards morning, or when much heated.

It is to be further observed, that whenever the circulation of

the gastro-enteric mucous membrane and its connected organs, as the liver or spleen, are disordered, they borrow, as it were, the assistance of the skin and its circulation. Hence in this perverted state, when food and drink are still continued to be taken beyond what the assimilative powers of the stomach are adequate to transform, and when the whole of the digestive organs are taxed beyond their natural powers, the aid of the skin is solicited, and the result is, that the skin in such persons, though dry and harsh, during the day, or when not heated by exercise, is during the night excited to an undue, unnatural, and morbid heat, which terminates towards morning in sweating more or less profuse. It is under such circumstances chiefly that exposure to cold is often succeeded by rheumatic attacks of various degrees of severity and permanence.

If the state now described cannot with physiological justice be denominated *plethora*, it may be regarded as one of irregular and improper distribution of the blood, with subversion of the balance of circulation between the skin on the one hand, and the gastro-enteric mucous membrane and the liver on the other.

In several instances the predisposition to rheumatic attacks has proved to be the existence of granular disease of the kidney, giving rise to albuminous urine with low density. Persons labouring under the latter disorder, when exposed to cold, are peculiarly liable to rheumatic attacks.

The predisposition or diathesis may exist for some time without giving rise to an attack of rheumatism, unless one or more of the exciting causes are applied. But when a patient so constituted is exposed to any exciting cause, an attack of rheumatism follows after an interval, variable in different individuals, and under different circumstances.

The Latent period.—The interval which thus elapses between exposure to any exciting cause and the first appearance of rheumatic pains or the full developement of the symptoms of the disorder, Dr Haygarth denominated the *Latent period*. The shortest space in the cases noted by him for this period was half an hour. Among 21 cases, in only 4 did it exceed the space of forty-eight hours; and in none was it longer than five days. Giannini states that he has seen the disease appear after an interval of fifteen days. Chomel states that it was in general within a period of from twelve to twenty-four hours after exposure, that the first symptoms appeared.

PATHOLOGY OF RHEUMATISM.—Pathology has not been

successful in elucidating the nature of rheumatic disorders. Cullen, who believed it to be an inflammatory disorder, inferred that the proximate cause of rheumatism is the same as that of other inflammations not depending upon a direct stimulus (457); or, in other words, that it is analogous to inflammations depending on an increased afflux of blood to a part while it is exposed to the action of cold; and assumed also the existence of a peculiar affection of the fibres of the muscles, which seemed, he argued, to be under some degree of rigidity, and therefore less easily admitted of motion; and were pained on exertion of motion (459). In short, he imagined, conjoined with an inflammatory affection of the sanguiferous system, an affection of the muscular fibres, which had a considerable share in producing the phenomena of the disease.

The chief objection to this hypothesis is, that the rheumatic pains are by no means either chiefly seated in, or confined to muscular parts, but are found, as in the case of large joints and the hind-head, to affect parts in which no muscular fibres are seated.

To Stoll the proximate cause of the disorder appeared to consist in inflammation in the lymphatic system, principally of tendinous, aponeurotic parts, of membranes and of muscles surrounding articulations and similar parts. This inflammatory process, however, he regarded as differing from true or genuine inflammation, in the pain being more diffused, the affected part in general swelling more considerably, being more severely painful, and yet less red, and in the pain and swelling showing a tendency to shift or wander about.*

Notwithstanding the manifest objections against the doctrine of Cullen, Dr Carmichael Smyth maintained that the phenomena of rheumatism depended chiefly on the presence of inflammation of the muscles.†

Somewhat allied to the hypothesis of Stoll was that of Dr Latham, who, while he denied the presence of inflammation, properly so called, in rheumatism, placed the seat of the evil in the fine and slender radicles or minutest divisions of the lymphatic vessels, in which he conceived obstruction took place either in consequence of constriction from cold, or any similar cause which contracts the diameters of these vessels.‡

* Pars Quinta Rationis Medendi, Sectio iii. p. 411.

† Medical Communications, Vol. ii. p. 217, 218.

‡ On Rheumatism and Gout; a Letter, &c. London, 1796. Pp. 9, 13, &c.

Bichat in general terms inferred that, in acute rheumatism, the pains depended on an inflammatory state of the fibrous parts of the articulations and the aponeurotic coverings of the muscles.*

Hildenbrand, who has bestowed on the proximate cause of rheumatic disorders more elaborate attention than any one since the time of Cullen, has given a view in several respects more profound, but at the same time more complex, and perhaps, in the present state of knowledge, less susceptible of proof. Overlooking the mistake he makes in placing the disorder in the serous membranes, as one not affecting the accuracy or final results of his reasonings, this physician argues that it is manifest from many circumstances, that the imponderable agents, as light, heat, and electricity, exercise considerable influence on the circulation of the textures of the human frame; that particularly they are adequate occasionally to subvert, and actually do subvert, the equilibrium or harmony of the circulation in the vessels of different textures; and that in the course of this subversion, and as an effect of it, the inherent properties of the textures making certain efforts to restore this equilibrium, give rise in these textures to certain changes, which finally constitute the material causes of rheumatic pains. This condition viewed generally, he regards as an abnormity or irregularity of the sensiferous energy irregularly distributed, or what is termed by Jaeger *Fluctuation*, understanding by this term a species of oscillation in the circulation of the capillaries of different textures thus influenced by physical and imponderable agents. He further thinks, that the instability of rheumatic affections shows that their pathological condition consists, strictly speaking, rather in simple congestion than in genuine inflammation.

Having established these preliminary principles, Hildenbrand maintains, that animal heat is the result, in the human body, of a form of electricity, to which he applies the name of the zoo-electric process, and between which and atmospheric electricity there exists, he thinks, an undoubted relation, though not yet fully investigated. There is also, he maintains, between these two forms of electricity an equilibrium which is liable to be subverted; and in this subversion, varying in degree and extent under different circumstances, consists the proximate cause of rheumatic disorders.

The chief arguments which he adduces as favourable to this hypothesis are the following.

* *Anatomie General*, Tome iii. p. 167. *Système Fibreux*, iii. § iii.

1. The skin, moistened by sweating or otherwise, is favourable to the origin of rheumatism; moist bodies readily absorb electricity. 2. Persons with dry skins are liable to rheumatism. 3. The remote causes of rheumatism are of that kind, that, under their operation, the tension of positive electricity is maintained; *i. e.* terrestrial exhalations, dewy or moist winds, atmospheric cold suddenly coming on, especially after inundations, storms, rains, and north winds. 4. Rheumatic pains present great analogy with the sensation of the electrical shock. 5. Persons labouring under rheumatism are conscious of the slightest changes in the atmosphere, and especially the approach of storms. 6. In the course of rheumatism a constant change of gasiform fluid into liquid is observed; and the same is known to take place in the atmosphere after electrical explosions. 7. Organs which are allotted to the evolution of imponderable agents, as the nerves and blood-vessels, suffer in rheumatism from the commencement; the reproductive system, on the contrary, which presides over the chemical process, scarcely ever presents remarkable derangements, excepting those of a secondary character. 8. In the torrid zone and the north, where the atmospheric temperature is most steady, either in great heat or in great cold, and also is less favourable to electric changes, rheumatic attacks are less common. 9. Rheumatic pains resemble electric shocks in the rapidity of their origin and transmission. 10. Agents which favour the production of electricity, as cold, moisture, the surface of metals, aggravate rheumatic pains. 11. Rheumatic sufferings, on the contrary, are mitigated by all idio-electric bodies, as the furs of animals, wool, cotton, a moderate and uniform heat of the atmosphere. 12. Friction, one of the principal means of exciting electricity, affords remarkable alleviation to rheumatic pains. 13. Animals which do not perspire are exempt from rheumatism.

In this hypothesis there are some correct and some questionable points. Many have remarked the connection between the subverted state of the atmospheric electric equilibrium, and the formation and aggravation of rheumatic pains; but the connection between this subverted equilibrium and other diseases has also been observed. The principal defect in the hypothesis is, that while it professes to explain the proximate cause, it looks chiefly to remote causes, and does not show how these remote causes produce in the human frame the peculiar symptoms of rheu-

matism. These symptoms, indeed, it refers to one general principle, viz. the subversion of the relation between the atmospheric electricity and the zoo-electricity of the human body; but it does not show, what are the parts of the organic frame on which this subversion operates, nor why these parts, when the seat of rheumatic action, give rise to symptoms so peculiar.

Dr Scudamore, one of the most recent authorities on the subject, regards acute rheumatism not as inflammation of any one tissue, or even as inflammation of a peculiar nature, but as pain of a peculiar character, with or without inflammatory action, affecting many tissues at the same time, but chiefly the white fibrous tissues of the muscles and joints. In acute rheumatism, he conceives the morbid action to be seated in the ligaments, the tendons, the aponeurotic membranes, and the bursal membranes, but in the ligaments most frequently. In the sub-acute form, though any of these textures, and even the nerves may be affected, the disease is most frequently confined to the bursal, that is, the synovial texture surrounding the tendons. In the chronic form again, though the disease may occur in the ligaments and tendinous tissues, he represents it as most common in the sheaths of the tendons and the aponeurotic membranes.

In this inquiry, there are two points which demand investigation; *1st*, What is the texture in which the rheumatic action is seated; and, *2dly*, What is the nature of the rheumatic action? And as these questions are closely and mutually connected, it is requisite to understand them thoroughly, before the pathology of the disease can be said to be established.

1. Pathological writers do not appear to be agreed with regard to the tissue or tissues which are the seat of disease during a fit of rheumatism. Cullen does not express himself very distinctly, unless in so far as he states it to be an affection of the muscular fibres; but as he represents the disease as first commencing in the vessels of the joints, "these being less covered with cellular texture than the intermediate parts of the limb," it follows that one part of this doctrine is at variance with the other. Carmichael Smyth considers acute rheumatism as mere inflammation of the muscular fibres, and ascribes all the peculiarities of the disease to the peculiar structure of the muscular system. (Medical Communications, Vol. ii. p. 217-218.) This view, however, is at best an ingenious assumption, and whether

it be true or false, its author has taken no pains to support it by suitable arguments. It is manifest that the circumstance of the rheumatic action being confined very much to the neighbourhood of the joints, is a formidable objection to the truth of this theory.

It is certain, however, that the rheumatic pain is often referred to muscular parts; but it appears to be less frequently so than to joints and to parts covered by aponeurotic sheaths, and other divisions of the white or fibrous tissues. Thus of 560 cases Haygarth observed 388 to be instances in which the rheumatic action was seated in joints, 118 in which it affected muscular parts, and 14 in which it was wandering, general, or moving up and down through the limbs. Of 170 cases, in 154 one or more joints were inflamed; in 33 cases both joints and muscles were affected at the same time; and in 9 cases only were the muscles affected without the joints. From these facts Haygarth infers that the acute rheumatism is chiefly seated in the joints, and that probably no joint is exempted from the disease.

As these facts naturally lead to the question, what particular tissue presents either in its local distribution, or in its pathological relations, characters to which these phenomena conveniently and accurately apply,—we are led to seek for one, which is neither confined exclusively to the site of the joints nor to that of the muscles, but which, in being common to both, though connected in a greater degree and more abundant extent to the former, may be naturally viewed as the animal tissue to which the rheumatic action is most generally to be referred. On anatomical principles, the only tissue to which this character easily applies, is that termed the aponeurotic sheath (*aponeurosis*; *fascia*), or tendinous expansion, which, invariably connected with the periosteum or capsular ligaments at the articular extremities, covers or supports each muscle to a greater or less extent, penetrates into the substance of the muscle, and which, in passing at each joint from one part of a limb to the other, and from the limbs to the trunk,—forms a covering of the greatest extent, next to the skin, in the human body. That the aponeurotic sheaths are the chief seat of acute rheumatism is to be inferred further from the following circumstances.

1. When the rheumatic action is seated in muscular parts, it may always be referred to the seat of the aponeurotic membrane,

which covers or penetrates them. 2. The pain which attends rheumatism is, like that which attends inflammation of the fibrous tissues, always aggravated during the night. 3. When the pain shifts or moves, it may be traced from one extremity or connection of an aponeurotic expansion to another. 4. The effusion which takes place into the tendinous sheaths is more easily understood in this view than in any other ;—for every sheath (*bursa mucosa*) is enveloped by part of the aponeurotic expansion, and the inflammatory action appears to cause, as in other analogous cases, a critical effusion in a contiguous tissue. 5. It is only in this manner that can be well understood the fact remarked by all authors, that rheumatism never almost terminates in suppuration. It is a mistake to suppose that muscle does not suppurate ; for I have shown that it does in the case of the heart ; and it is certain that it suppurates in the case of the *psoæ* muscles ; and the proper explanation of this phenomenon is found in the fact of the little tendency which the fibrous tissue has to suppurate, unless when mechanically injured. 6. If it were the muscles only that were affected, the disease would less frequently be followed by rigidity of the limbs and joints. A termination not uncommon of rheumatism is contraction and stiffness of a joint, with incapability of extension or motion. This is caused by thickening of the aponeurotic fasciæ, in consequence either of increased vascularity or the effusion of lymph. These aponeurotic coverings then lose their pliancy, and become thick, rigid, and sometimes contracted and adherent to the neighbouring, the subjacent, or the incumbent tissues, and thus impede the motions and the mobility of the limb.

2. On the nature of the rheumatic action it is not easy to come to a precise conclusion. Facts are either too few or too vague to be useful ; and reasoning in such circumstances is not very much to be relied on. All that can be well said is, that, if the previous views regarding the seat of the disease be well founded, the inquiry is resolved into the question, whether rheumatism consists in mere inflammation of the fibrous system, or whether it is a peculiar form of inflammation ? The only argument that could be urged to the contrary will be found in the circumstance of inflammation of fibrous texture producing other effects, *e. g.* suppuration and ulceration ; and as this is not established, it may be inferred that there is nothing specific in the rheumatic inflammation, and that there is no ground for any distinction

further, than that of its greater or less degree of acuteness, or into acute, subacute, and chronic.

I must not omit to observe, however, that rather a strong argument in favour of the peculiar nature of rheumatic disorder, and against its being confined to certain tissues exclusively, may be deduced from the history of its terminations and metastatic actions. It will presently appear that rheumatism, though usually attacking the external parts of the body, is not in all cases, nor during the whole course of any given attack, confined to these, and that there is scarcely a texture or organ of the body, in which, it may not give rise to symptoms and effects of morbid action. The peculiarity of these terminations and metastases is, that the rheumatic action is not in them confined to a single texture, otherwise it could be more easily understood; but appears simultaneously or successively in the most different tissues. Thus rheumatic action, when it attacks the heart, may affect either the pericardium alone, or the cardiac substance alone, or both at the same time; and it not unfrequently attacks, in the heart of the same patient, the pericardium, capsular and cardiac,—the muscular substance of the heart, and the internal or lining membrane, causing *endocarditis*.

These phenomena, to which attention shall be more fully directed afterwards, would lead to the inference, that rheumatism is rather a peculiar action than inflammatory disease of a particular texture; that it assumes two or more forms, one a simple and regular form, in which it attacks first and preferably the aponeurotic membranes; and another,—a complex and anomalous form, in which, though it first attacks these membranes, it may either abandon them, and attack various internal compound organs, or it may continue to affect at the same time the external *aponeuroses* and the internal organs.

The proof now mentioned, nevertheless, furnishes only probable, not certain or unequivocal, evidence of the individual and peculiar nature of the rheumatic action; and accurate knowledge of the anatomical relations of the aponeurotic membranes would enable the pathologist to understand how even rheumatic action, though originally seated in these membranes, might afterwards affect various internal organs.

In the most usual case, that of the pericardium and the heart, the aponeurotic centre of the diaphragm may be regarded as the focus or centre of concentration and subsequent radiation of the morbid action. The diaphragm is connected with almost

all the aponeuroses of the trunk and chest, and through these to those of the extremities. If the morbid action pass or be conveyed to the tendinous centre, it may then affect first the exterior, then the capsular or inner pericardium, then the cardiac and the substance of the heart; and it may from the same point affect the peritoneal or abdominal serous membrane and the connected viscera. The transition from the external aponeuroses to the cerebral membranes is in all probability made from the epicranial fascia to the *dura mater*.

DIAGNOSIS.—Acute rheumatism is to be distinguished from gout, from chronic rheumatism, from nodosity of the joints, from scrofula, from tic-douloureux (*neuralgia*), from white swelling, and diseases of the joints in general, from periosteal inflammation, from syphilitic pains, and those which result from mercurial poisoning, or that species of periosteal inflammation and sensibility which is observed in the frames of those, who have taken mercury in large quantity and repeated doses.

a. The diagnosis between gout and rheumatism is not easy. In general, however, gout affects the small joints, attacks at a later period of life than rheumatism, is more disposed to attack internal organs, and is generally associated with more evident gastric disorder and urinary affection.

b. From chronic rheumatism it is to be distinguished by the presence of fever, by affection of the natural functions of digestion, secretion, and excretion, by the severity and exacerbation of the pains, by the subjects whom it attacks, and the season at which it prevails, and, according to Haygarth, by the local swelling, which is never found in the chronic form of the disease.

c. From nodosity of the joints it is to be distinguished by the situation of the disease, and the appearance which it causes in the fingers. It must be observed, nevertheless, that nodosity of the joints may take place as an effect of rheumatic or podagrorheumatic disorder.

d. From tic-douloureux and the different forms of *neuralgia* it is easily distinguished by the kind of pain which in this disease takes place in paroxysms, and by the situation being over a nervous chord or not. The same may be said with regard to neuralgic pains in general, and the *Ischias Nervosa* of Cotunnus in particular. Cases, nevertheless, occur in which rheumatism is associated with *neuralgia* and *neuralgia* with rheumatism.

e. From scrofulous or other affections of the joints it is sometimes not easy to distinguish rheumatism, and instances are not

unfrequent in which they are confounded. But, in general, they may be distinguished by attending to the following marks. In acute rheumatism not one joint is affected, but in general several; in inflammation of the synovial membrane, the disease is generally confined to one joint. In acute or subacute rheumatism the pain is severe but moves from one joint to another, and along the course of the aponeurotic fibres; in diseased synovial membrane the pain is generally less severe, but quite fixed, and remains as a dull sore sensation, aggravated by motion of the joint or deep-seated pressure.

f. In persons who have had an attack of syphilis, and who have taken mercury for the removal of the syphilitic symptoms, pains in various parts of the body, especially referred to the bones of the extremities, are liable to take place, and become very excruciating during the night. It is not ascertained whether these pains are the genuine result of the secondary symptoms of syphilis, or depend on the poisonous action of mercury on the system. It is certain that now, when syphilis is rarely treated with mercury, they are much less frequently observed; and it is also certain that, in the persons of public females and others who take mercury on their own responsibility, these pains are very frequent. When the seat of these pains, which are most felt during the night, is examined, they are found chiefly to affect the long or the flat bones, where they are near the skin, or, in other words, thinly covered by integuments; and instead of being at the extremities of the bones, as is the case in rheumatism, they either affect the centre, or pass along the bodies of the bones, without reaching either extremity. These pains are always found to be dependent on inflammation of the *periosteum*, which is often swelled in the shape of flat, oblong, but distinctly elevated tumours, and which is generally painful on pressure, and rough and irregular. These tumours, usually called nodes, depend on the periosteum, being thickened by blood in its vessels, blood and lymph effused in its interstices, and often blood and lymph, or even matter effused between it and the bone. From the acute pain which attends the process, especially during the night (*Dolores Osteocopi*), these symptoms are often referred to the head of rheumatism even by medical practitioners. The error is important both in pathology and therapeutics; and every skilful practitioner should avoid it, and take care by his example to give it no countenance.

The diagnosis is in general not difficult. Not only the his-

tory of the case may be employed to determine the nature of these pains ; but the circumstance of their extreme severity during the night, the presence of pain over the bone, with elevation, roughness, and irregularity, with the absence of general fever and the presence of other symptoms, as eruptions and sore throat, will be sufficient to determine the true nature of the case. The bones most usually affected are the plane flat surface of the *tibia*, the outside of the *ulna*, the inferior surface of the radius, the clavicle, the sternum, and the frontal bone.

COMPLICATIONS, TERMINATIONS, AND METASTASES.—In the researches of Stoll and Haygarth our attention is called to the combination of rheumatism with other diseases. In the combination with frenzy, the delirium is either a symptom of the attending fever, or of approaching or established metastasis to the cerebral membranes; and there is every reason to believe, as Haygarth remarks, that the miliary eruption occasionally observed in rheumatic cases is the result of the sweating treatment, (p. 32.) Of the combination with catarrh it is sufficient to know that it may take place ; and though that with diarrhoea or dysentery is rare in this country, it would be scarcely fair to doubt the testimony of Stoll, who observed it in Vienna. Of the connection with fainting (*syncope*,) which is greatly more important, I shall speak presently.

Acute rheumatism may terminate either in resolution, in effusion of fluid into the synovial sheaths, in chronic rheumatism, or in rheumatic affection of an internal organ, chiefly the heart, or lungs.

The first, second, and third modes are easily understood, and the symptoms will show readily when they take place. The fourth is attended with great danger, and the practitioner must use every effort to prevent its approach, and obviate its occurrence.

1. Though Fowler remarked that in acute rheumatism, the brain is rarely affected, and though all agree that delirium or other symptoms indicating cerebral disorder are exceedingly rare, yet such instances have taken place ; and while the same author mentions an instance in which a sudden transition of the disease to the brain, marked by delirium, proved the fatal termination, (p. 263) ; Haygarth records seven fatal cases, in which the presence of delirium led him to infer the existence of phrenitis or meningeal inflammation. (p. 62.)

Though the metastasis of rheumatism to the cerebral membranes is not very common, I have met with two examples of it,

both taking place in females. Both were affected with symptoms of acute or subacute rheumatism, affecting various parts of the limbs and trunk, in one the intercostal muscles. In both there was considerable fever, with quick tense pulse, and in one the pulse was about 120, and between that and 140. Both were treated by moderate depletion, with opiates as diaphoretics and anodynes, and the use of cathartics and colchicum. In one case, the metastasis showed itself at once, and suddenly, after the visit of a relative, when the patient was convalescing, by incoherence of thought and language, great restlessness and sleeplessness, constant talking and noise, turning much on religious subjects, and eventually *monomania*, lasting for two or three weeks, with complete disappearance of the rheumatic symptoms. In the other case the patient complained first of headach, referred chiefly to the frontal and cervical regions, and, after a day or two of this, with quick pulse, but with abatement of the rheumatic symptoms, she became incoherent in thought and speech, and violently delirious, with restlessness, sleeplessness, and constant talking. Both cases recovered completely; and, previous to recovery, evinced a sort of gloomy morose taciturnity, quite the reverse of what had first taken place.

2. A more frequent and not less dangerous transition is that which has been described by many authors, as rheumatism attacking the substance of the heart. Much information has been communicated on this subject since the year 1808 by Dundas, Wells, Ferriar, Bedingfield, Falloon, Adams, Cox, Hawkins, and Bouillaud. From the observations of these authors, it appears that this mode of termination consists in a transition or *metastasis* of the rheumatic action from the external parts originally affected to the heart, in which it gives rise to inflammation, sometimes acute, more commonly semiacute or chronic, terminating in enlargement of the organ, and dropsical effusion over the body, and becoming fatal in the usual mode by suffocation. In general, after an attack of rheumatic pain in the joints of the limbs, a sense of anxiety and oppression at the breast, with difficult breathing, and violent beating of the heart (*palpitatio*), come on, and become so urgent as to threaten immediate death. The pulse is always very quick, often irregular, generally hard; the carotid arteries throb violently; and the patient complains grievously of noise in the ears and head, and giddiness. While these symptoms continue, the external pains and swelling generally diminish, or are

not mentioned ; but in some few cases they continue with those of irregular action, strong impulse, and diffused pulsative range of the heart. Sometimes there is pain in the region of the heart. If the disease do not disappear spontaneously, or under the use of remedies, the pulse of the heart becomes exceedingly quick and languid, the difficulty of breathing and oppression become urgent and extreme ; the appetite fails, the flesh wastes, and the strength decays ; dropsical effusion takes place in the lower extremities and over the person ; and the individual expires with the usual symptoms of diseased heart and effusion within the *pleura*. On dissection the heart is found more or less enlarged, the *pericardium* adhering, more or less serous fluid effused into the *pleura*, and the substance of the heart pale, soft, and tender, sometimes firm and hard, with enlargement of the left ventricle and thickening of its walls.

From a considerable number of cases of disease of the heart consequent on rheumatism, which have fallen under my own observation, I infer that rheumatism attacking the heart may produce one or two of three lesions, or all three together. *First*, it may attack the pericardium, and produce pericarditis, most usually acute, but not unfrequently subacute or chronic. In the latter case, it causes slow effusion of albuminous exudation, which coagulates and causes adhesion of the pericardium to the heart ; (*Symphysis Cardiaca*). *Secondly*, it may attack the inner or lining membrane of the heart, constituting *Endocarditis*, especially that of the left ventricle, where it forms the mitral valve, which is then rendered thick, rigid, and opaque, sometimes brittle, and is ruptured, and sometimes receives into its substance steatomatous or bony matter. The action of the heart is then rendered exceedingly irregular, jarring, laborious, with a strong impulse, a rasping or sawing murmur, (*strepitus serrans*,) and a beat diffused over the whole chest. The breathing is also difficult and laborious, and the face becomes livid, or pale and sallow, with livescence of the lips. This lesion is liable to give rise to hypertrophy or enlargement of the heart. *Thirdly*, rheumatic action may attack the substance, causing enlargement or hypertrophy of the organ, with the usual effects and symptoms.

Endocarditis of the mitral valve may be associated with hypertrophy, and often is associated with it ; in other instances, *endocarditis* is associated with pericardial inflammation ; in others, hypertrophy of the heart is associated with pericardial inflammation ; and in others the whole three lesions are united in a single heart.

This translation of the rheumatic action has been hitherto generally observed in young persons. In nine cases observed by Mr Dundas, only two were above 23 years of age, and six were males, and three females. In Dr Pemberton's case, the patient was 36, and in a fatal case by Dr Marcet, 29 was the age. Of seventeen cases recorded by Dr Wells, one was in a boy of 10, one in a girl of 13, two occurred in girls of 14, two cases occurred at 15, three at 16, one at 17, one at 18, one at 19, one at 20, one at 21, and one at 24, at 25, and at 36. Of these cases, eight occurred in males, and nine in females. Among nine cases I have seen one of pericardial inflammation in a young girl of 14, five of hypertrophy in persons of the ages of 8, 12, 16, 19 and 20, two of hypertrophy and pericarditis in persons above 40, and one in a young man of 18, in which the whole three lesions were united.

3. A third mode of translation of rheumatic action is that by its transition to the lungs, with the usual symptoms of pneumonic inflammation. Of this, Haygarth records one instance in which the prominent symptoms were, cough, difficult breathing, and spitting of blood, (Clinical History, p. 100); Wells states that he saw four persons die of peripneumony supervening on acuter rheumatism; (Transactions of a Society, Vol. iii. p. 406); and Bateman mentions two instances in which the disease in the persons of two men of 40 years terminated fatally, with restlessness, difficult breathing, and other signs of pulmonic oppression; (Reports, p. 62). As of the last mentioned cases there was no dissection, it may be almost presumed that these were examples of fatal *endocarditis* and *pericarditis*.

4. A fourth mode of termination by translation has been remarked by Mr E. M'Dowall in the transition of acute rheumatism into peritoneal inflammation. It occurred in the person of a woman of 28, who was labouring under severe pain and swelling of the knees, with the usual feverish symptoms of quick full pulse, great heat and thirst, furred tongue, and general restlessness. About eight days after, when the local symptoms had much abated, she was attacked with griping pain of the bowels and swelled tense belly, painful on the slightest touch, with small quick very feeble pulse. Blood-letting was performed and leeches were applied; but death took place in the course of a few hours. The blood drawn was much buffed and cupped; and the peritoneum presented the usual appearances of inflammation. (Dublin Hospital Reports, Vol. ii. p. 325.)

In short, it may be inferred that there is no organ or texture of the internal structure which may not be attacked by rheumatic action. And perhaps it is in this manner chiefly that we are to understand the fact noticed by almost all practical authors, that rheumatism is rarely a fatal disease. While it remains in its first situation it is not dangerous; but becomes very serious when translated to an internal organ, the functions of which are closely connected with the continuance of life. "Rheumatismus," says Professor Callisen, "externas partes occupans, fixus, periculo carere solet; vagus internas nobiliores partes petens, maximas sanitati ac vitæ insidias struit." (*Systema Chirurgiæ Hodiernæ*, Tom. i. p. 228.)

THERAPEUTICS.—In undertaking the treatment of acute or subacute rheumatism, whether we view the inflammatory state of the aponeurotic membranes as primary and idiopathic, or secondary and symptomatic, it is necessary, in the first instance, to adopt the antiphlogistic method of treatment, and to carry it on with some degree of energy, and to a considerable extent. This is requisite not only to remove immediately the phlogistic or inflammatory diathesis of the system, but also to assuage the intensity of the local disorder.

The different branches of the antiphlogistic regimen requisite in the treatment of rheumatism are blood-letting, general and local, the occasional employment of cathartics, the occasional employment of emetics, especially tartar emetic, the use of diaphoretics, and the use of revellents.

a. On the use of blood-letting the opinions of physicians have varied much. Sydenham in the early part of his practice employed blood-letting to a considerable amount, and repeatedly, according to the intensity of the symptoms, in the treatment of the acute form of the disorder. But it appears that, in this respect, his opinions had undergone some revolution as he advanced in life; for in the answer to Dr Brady, he allows that he had often regretted that it seemed necessary in the cure of rheumatism to employ large and repeated blood-letting, which impairs the strength, and disposed to the attacks of other diseases; and hence he had been led to think of some method of treatment different from that of repeated blood-letting; and this he believed he found in the substitution of diet consisting of whey.* Boer-

* *Epistola Responsoria ad Robertum Brady, M. D. apud opera. Londini, 1705, p. 282.*

haave, notwithstanding, recommended blood-letting; and Tissot, who derived most of his pathological and therapeutic principles from the Leyden professor, employed blood-letting largely and repeatedly, in the removal of the symptoms of acute rheumatism,* yet did not neglect the use of whey and other adjuvants. Sir John Pringle, in like manner, found full blood-letting, occasionally repeated several times, quite indispensable in the robust, young, or middle-aged adults of the army;† and Dr Donald Monro, in similar circumstances, states that he drew blood freely, and repeated the evacuation often, if the blood continued sizy and the pains were violent, provided the pulse was strong.‡

Huxham, though he admitted the necessity of blood-letting in the general principles of the treatment of rheumatic disorders, was opposed, however, to its indiscriminate and uniform employment; and thought that he could distinguish a particular order of rheumatic maladies, which he ascribed to the presence of what he termed a sharp serous rheum, in which he maintained that the lancet was decidedly detrimental, and that the disorder was more happily treated by the administration of the mild and cooling diaphoretics with gentle opiates.§

Stoll, in the treatment of inflammatory rheumatism, that is, acute or febrile rheumatism, recommended and practised copious and frequent venesections, aided by the use of local bleeding, by means of scarifications and the application of leeches,—and the internal employment of diluents; and if, after much blood was withdrawn, the febrile symptoms were protracted beyond the eighth day, with a feeble soft pulse, he directed the use of the camphor emulsion. To the use of opium he was averse. In the bilious rheumatism, which constitutes by far the largest proportion of cases in large towns, he prescribed emetics and cathartics. (*Rationis Med. Pars v. Sectio iii. p. 421.*)

Cullen, though obliged, in principle and in theory, to admit the necessity of blood-letting as the chief remedy, both in large quantity and at repeated times, in proportion to the frequency, fulness, and hardness of the pulse, was inclined, nevertheless, to set some limits to this treatment, and attempted to find, in the employment of local bleedings and the use of cathartics and dia-

* Advice to the People, &c. Chapter xi. §. 168, and §. 169.

† On the Diseases of the Army.

‡ An Account of the Diseases most frequent in the British Military Hospitals, p. 143. London, 1764.

§ De Aere, Vol. ii. p. 185.

phoretics, a substitute for the use of a method which he conceived to be detrimental.

Since the time when Cullen attempted to define and specify the conditions to be observed in the employment of blood-letting in the treatment of rheumatic disorders, various changes have taken place in medical principles and practice.

Dr Fowler tried blood-letting in a great number of cases, (41 among 87 cases), and found that three cases were cured, seven much relieved, seven moderately relieved, twenty little relieved, and four not benefited. He was more disposed to trust to the local bleeding by leeches and the use of diaphoretics. (Reports.) Dr Latham, who denied the essential inflammatory nature of the disorder, regarded blood-letting also as not in all cases requisite, and only to be employed if diluents, laxatives, and rest were ineffectual in relieving the pains. (On Rheumatism and Gout, p. 21 and 31.)

Though Heberden allows that venesection should be prescribed for patients in the prime of life, of robust constitution, and who have contracted the disorder in the same manner in which other inflammatory disorders are induced, yet he adds that he had learned by experience, that copious and repeated blood-lettings were unsuitable to the majority of patients in this disorder, and he mentions an example of a person who, soon after profuse epistaxis, had been attacked with most severe rheumatism. (Commentarii, Cap. lxxix. p. 345.) Dr Fordyce, in like manner, though he first employed blood-letting, at a subsequent period abandoned it, in the treatment of acute rheumatism, as he thought its use disposed to metastasis to the internal parts, with fatal termination. Willan, observing that the disease in London was not attended with the same marks of acute inflammatory fever, but was often accompanied with feeble small rapid pulse, and other marks of languor, maintained that blood-letting was detrimental by enfeebling the patient, and did not make a salutary impression on the disorder, and accuses the evacuating mode of treatment of causing a fatal termination in some instances by internal translation of the disease.

The example of these practitioners has had considerable influence in deterring many practitioners from the free and repeated use of the lancet in the treatment of acute rheumatism; and it is believed that blood-letting is unnecessary to the cure of acute rheumatism in London, or sometimes injurious. (Wells, Transact. of a Society, Vol. iii. p. 409.) And the valuable tes-

timony of Mr Bedingfield has either been overlooked or thought inapplicable to the constitutions of patients in large and densely peopled cities like London.

I have shown here the testimonies of different practitioners upon this important practical point, because it is one which can never with justice be determined by the number of suffrages, nor with any propriety by adducing the experience of any individual practitioner. After a pretty extensive trial of blood-letting, aided by other remedies, especially diaphoretic medicines and cathartics, and after attempting the removal of rheumatic attacks without blood-letting, and comparing the history of the cases that have been either left to nature and time, or have been treated by opiates and diaphoretics, I must say that I see decided reasons for giving the preference, on the whole, to the employment of blood-letting in the acute and subacute forms of the disorder. I have studied further to discover and to specify the circumstances under which it becomes efficient, and those in which it is not detrimental; and I think we are entitled to specify the following conditions.

First, General blood-letting, in order to be beneficial, ought to be performed early in the disease, and carried to a considerable extent. Within the first three or four days is the best time, and, at all events, within the first week. I do not say that it should not be performed after this period; but it is performed with the disadvantage of being less likely to make a decided and sanative impression on the seat of the disorder.

It should be carried at first to 20 or 25 or 30 ounces at once if possible; and within twenty-four hours to as much more. It is not wonderful that blood-letting was not beneficial in the hands of Fowler and others, who seldom drew more than 8 or 10 ounces, and with whom 12 or 15 ounces was a full blood-letting. I have repeatedly drawn 20, 25, and 28 ounces from females, not only without detriment, but with the most beneficial effects.

Secondly, The influence of general blood-letting must be aided by the conjoined operation of various adjuvants. Full vomiting, produced by ipecacuan and antimony, is, in the majority of cases, requisite; and complete evacuation of the bowels by ecoprotics and even cathartics is quite indispensable. The particular remedies shall be specified immediately.

Thirdly, It is of the utmost importance, in attempting the thorough removal of rheumatic pains, to conjoin with blood-letting, or, after its use, the administration of full doses of tartrate

of antimony, so as to act on the circulation of the alimentary canal and the liver. The best plan I have found to be is to dissolve six or eight grains in one ounce of water, and give a teaspoonful of the solution three or four times daily, or every second hour until the whole have been taken. This is followed not by vomiting in general but by sickness, diaphoresis, and slight diarrhoea, under which the articular pains disappear.

Fourthly, It is of great moment, if the bowels have been previously well opened, to exhibit, after the first blood-letting, an opiate of forty or fifty minims of the solution of muriate of morphia; or, if the bowels have not been freely moved, to effect this indication, and take a second blood-letting, and after this to administer the opiate, which may be either given alone or conjoined with antimony.

b. Eccoprotic and Purgative Medicines.—Though the administration of these medicines has been recommended as part of the antiphlogistic regimen, yet physicians have attached little importance to their use as therapeutic agents in rheumatic disorders. Neither Fowler nor Haygarth, who studied to determine the true therapeutic influence of different remedies, make any mention of the use of cathartics; and it has been commonly said, that their exhibition was inadmissible and detrimental in acute rheumatism, from the trouble and the exposure to which they subjected the patient. Yet not only do physicians appear, in this matter, to have overlooked the fact of almost uniform derangement of the alimentary function, but also the benefit resulting from the use of guaiacum, when it produces a loose state of the bowels. I must also observe, that I have, in the course of administering tartrate of antimony for the treatment of rheumatic disorders, several times observed, that after it had produced rather profuse catharsis, the articular pains underwent remarkable abatement, with reduction of the pulse to the natural standard; and they finally disappeared. Colchicum also very often purges smartly before it relieves the articular pains.

In the commencement of the treatment of any rheumatic case, it is always necessary to exhibit cathartic medicine, so as to empty the bowels, and enable the physician to see the nature of the alvine excrementitious matters. This may be accomplished either by the compound jalap powder in suitable doses, or the compound colocynth pill, or the saline infusion of senna. After this has been done some fulness or congestion of the intestinal

or the hepatic vessels may remain ; and it is desirable then to exhibit several times calomel and colocynth, or calomel and jalap, or associate with the colocynth pill the blue pill, every second night, and give one ounce of castor oil the following morning.

Among the common people tradition has preserved the use of the purging flax (*Linum catharticum*,) and other strong purgatives ; but the effects are not so beneficial as to justify their general adoption.

A medicine which, I think, from what I have seen of its effects, is both peculiarly indicated and of great service as a cathartic in almost every form of rheumatism, is the common oil of turpentine (*oleum volatile pini laricis*,) which, given in the dose of one ounce, seldom fails to be effectual in moving the bowels several times, bringing away much morbid mucus and bad secretions. Its exhibition should be followed at the interval of two hours, or next morning, by a full dose of castor oil. When it is disagreeable, and is thereby liable to be rejected by vomiting, it may be administered in doses of two or three ounces by enema, along with gruel, or four or five ounces of the saline infusion of senna.

c. *Diaphoretics*.—Though spontaneous sweating be one of the symptoms of rheumatism, and as such is rarely beneficial, and therefore not to be encouraged ; yet it has been observed, that diaphoresis produced in an artificial manner is often of great moment, both in diminishing the intensity of the febrile symptoms and in assuaging the severity of the pains, and effecting their final removal. Among this class of medicines different kinds have been used at different periods and by different practitioners. Those sudorific medicines to which experience may now be said to allow most efficacy in the treatment of acute rheumatism, are antimony, either alone or with opium, the compound powder of ipecacuan, called *Dover's powder*, guaiacum, generally in the form of tincture, and the combination of opium with calomel.

α. Of antimonial medicines the most common in the treatment of rheumatism used to be James's powder (*Oxydum Antimonii cum phosphate calcis*) administered in the ordinary dose (from three to eight grains every third hour) and manner till sweating took place. It is now more common to use emetic tartar, either in solution with tincture of opium, or in pill with opium in sub-

stance. Its effects are entirely the same as those of other antimonials or sudorifics. It is also given alone for the purpose of emptying the stomach and bowels; but this is believed to be rarely requisite, unless when it is intended to use the Peruvian bark.

β. Dover's powder (*Pulvis Ipecacuanhae et Opii*) is a useful and much used remedy in the treatment of acute rheumatism, and has been regarded as a sort of anti-rheumatic specific ever since the publication of the Ancient Physician's Legacy. By many it is considered as the more convenient and effectual of sudorific medicines,—and to be in many instances adequate to the cure of the malady. This compound contains in every ten grains one grain of ipecacuan, one grain of opium, and eight grains of the sulphate of potass. The ipecacuan counteracts the narcotic effects of the opium, and the opium diminishes the nauseating effects of the ipecacuan, and determines to the surface.

To the favourable therapeutic operation of Dover's powder certain conditions are conceived to be requisite.—1. The powder should be administered in the morning after the ordinary time of sleep is over; because, though sleeping is not incompatible with sweating, yet it is not favourable to that kind of diaphoresis produced by the powder. 2. The powder in the dose of one scruple, one scruple and a half, or two scruples, is most conveniently taken, by being made into a bolus with syrup or treacle, and swallowed enclosed in a wafer that its taste may not cause squeamishness. 3. To guard against the influence of cold, the patient should be laid in woollen, that is in a flannel shirt, and, if possible, in flannel sheets or blankets, the bed-linen being removed. 4. The covering of the body may be only that in which the person has been accustomed to sleep; but it is usually desirable to make some addition over the whole body, and always a considerable addition over the legs and feet. 5. As after much drink the powder is liable to be rejected, the patient should refrain from drinking till sweating take place; and after this, he may frequently take small portions of any warm diluent, liquid or vegetable ptisan, as oatmeal or groat gruel, sage tea, balm tea, or common bohea tea, or rice water.

The dose of Dover's powder for an adult is one scruple, which contains two grains of opium; and this may be augmented to one scruple and a half, equivalent to three grains, or two scruples, equivalent to four grains. If this be conceived to be

too large at first, it may be best to give first one scruple and then another, or increase the proportion of ipecacuan. Dr Dover, himself, the author of this compound, was in the habit of giving large doses of it; from 40 to 60 or 70 grains, equivalent to 4, 6, and 7 grains nearly of opium. It is further the opinion of several practitioners, that the powder prepared according to the original formula of Dover is more efficacious in curing rheumatic disorders than that according to the modern formula.

Though it is chiefly indicated where there is a tendency to looseness or purging, yet it will answer in almost every case of acute rheumatism, unless where experience shows that from idiosyncrasy the opium is injurious. It is generally effectual after blood-letting in relieving pain and procuring sleep.

γ. The diaphoretic powers of the tincture of guaiacum are very considerable; and ever since it was introduced to notice, by the cases of Dr Dawson, it has enjoyed considerable reputation as a remedy in rheumatism. Dr Fowler in particular, who took much pains to ascertain its efficacy and virtues, speaks very highly of it, and thinks its reputation by no means equal to its merits. He represents it as a useful remedy in every stage of the disease; and as he found it often to move the bowels gently without griping, it may supersede the use of purgative medicines entirely in the treatment of acute rheumatism. The medium dose is half an ounce of the tincture in about three ounces of water at bed-time, to be increased to five or six drachms, or diminished to two or three, according to its effects, and the ages or constitutions of patients. Its operation, like that of other sudorifics, will be much promoted by the assistance of what is called the sudorific regimen, or drinking warm diluting liquors in bed. In the practice of Fowler it was given early in the evening, that the patient might be supplied regularly by his attendants, with a tea-cupful of warm balm or other herb tea, or weak white wine whey every half hour for two or three hours together. (Medical Reports, p. 228.) In other instances it was given in the morning, some hours before rising, when the natural disposition of the skin to moisture was manifest in easy and copious sweating. The purgative effects of guaiacum, without sweating, which Fowler remarked in some of his cases, are in all probability to be ascribed to the neglect of the auxiliary power of the sudorific or diluent regimen. If it occasion sickness or vomiting, the dose must be diminished, and after a full dose of ipecacuan it may be resumed.

δ. Opium has been at all times considered as a powerful sudorific; and one of the best proofs of its efficacy is, that there has been scarcely any celebrated sudorific composition of which it has not formed a principal ingredient. Its union with antimony or ipecacuan has been already noticed; it is scarcely less efficacious alone. In substance or in tincture it has been administered with great advantage in all cases of severe rheumatic pains; and in the acute form of the disease it is singularly useful in mitigating the sufferings of the patient and procuring sleep. The example of Sydenham, and authority of Cullen, indeed, condemned its exhibition in acute rheumatism, and pronounced it injurious in every stage of the disease; but this must be answered by the fact, that the administration of opium is followed by relief, and in many instances by cure. Thus, in addition to the well-known fact, that many practitioners give it liberally for removing rheumatic pains, Dr De Roches records two cases in which it effected a cure. (Med. and Surg. Jour. Vol. i. p. 154.) We may also justly adduce in opposition to the opinions of Sydenham and Cullen the practice of Heberden, who has truly said, that, notwithstanding the prohibition of Sydenham in this malady, opium proves a safe and effectual remedy for the purpose of mitigating the pains and of procuring sleep; and it has not only palliated the symptoms, but has been found to contribute to the cure of the disease, more by its calming and soothing, than by its sudorific power; “nor,” concludes he, “do I know that it is more efficacious when administered in Dover’s powder or mixed with antimony than when given alone.” (Commentarii, chap. lxxix. p. 347.) If a rule of restriction in the exhibition of this remedy is to be observed, we should say, that it is most likely to be beneficial after blood-letting, general and local, when the inflammatory state both of the system and of the affected parts is abated. After this it may be safely given at all times of the disease in doses sufficient to procure sleep.

ε. The combination of calomel with opium is the next form in which this medicine may be administered for the cure of acute rheumatism. The mode of administration and the effects have been already mentioned, when treating of its exhibition in pneumonic inflammation. Cullen has expressed his doubts of the efficacy of calomel combined with opium in this disease; but I can only say that I have repeatedly seen it administered with the most perfect success.

ζ. Meadow saffron (*Colchicum autumnale*,) is another medicinal

agent which may be referred to the same head, as more or less efficacious in assuaging the severity, or facilitating the removal of rheumatic pains. The preparations in which it is given are either in substance, viz. the powder of the root, or in vinegar, or wine of the roots, or tincture, or wine of the seeds, or in oxymel or syrup of the roots. The preparations most usually selected as containing all the active principles of the drug, are the wine of the root, or the wine or tincture of the seeds. Either of these may be given in doses of 20, 30, or 35 minims from three to six times daily. Their physiological effects are first slight and transitory sickness, then a feeling as if the bowels were about to be emptied, and soon after, with a call to stool, evacuations more or less copious take place from the bowels. In some instances after these alvine evacuations, or along with them, the patient feels slightly squeamish, and brings up by vomiting a considerable quantity of thin watery liquid. At the same time, or soon after, the patient becomes listless, inactive, and inclined to sleep, and not unfrequently does sleep, while the pulse is observed to fall much in frequency, and to become small and feeble. If pains be felt in any part of the body, these are very generally much relieved, and sometimes altogether removed.

Much of course will depend upon the amount of the medicine given in the course of a specified time, so as to allow the effects of successive separate doses to accumulate. From the observations and experimental trials of Dr Lewins of Leith, with the wine of the seeds, it appears that 40, 50, or 70 minims may be taken without any other effect than a feeling of temporary weakness and languor. But when the amount was augmented by the addition of other 60 minims, nausea was induced; and after 60 more were taken, the bowels were made to discharge copiously liquid contents. (Edin. Med. and Surg. Journ. Vol. xlvii. p. 345.)

I have seen the wine of the root when exhibited in doses of 30 drops four times daily, give rise to very profuse catharsis, followed by great feebleness of the pulse, and a contracted dingy aspect of the countenance, exactly similar to that induced by cholera. These effects are to be ascribed to the operation of *veratria*, which constitutes the active chemical principle of the meadow saffron.

The safest mode of exhibiting the drug in order to obtain its therapeutic effects in the treatment of rheumatic disorders, is to combine it with the sedative liquor, or the solution of muriate of morphia, or the vinous tincture of opium, in the proportion of two parts of the meadow saffron wine to one part of sedative

liquor, or solution of muriate of morphia. Given in this manner to the extent of 90 minims of the former, and 45 of the latter in the course of the twelve hours, it has often a remarkable effect in diminishing the severity of the pains, without causing sickness or catharsis, in reducing the frequency of the pulse, and in eventually removing all the symptoms of the disorder. When it purges much, its use may be suspended for a day or two, or the proportion of the sedative liquor, or solution of muriate of morphia may be augmented.

7. Various vegetable substances containing narcotic or narcotico-acrid principles, have been also proposed and occasionally employed in the treatment of rheumatic disorders. Thus hemlock (*Extractum Conii maculati*,) stramonium (*Extractum Daturæ Stramonii*,) and aconite or monkshood (*Extractum Aconiti Napelli et Aconiti paniculati*,) have all been at different times, and by various practitioners, employed in the treatment of acute or sub-acute rheumatism. Hemlock, though recommended by Storck, seems to possess no peculiar sedative influence over the severity of the rheumatic pains. An extract of stramonium was recommended by Dr Marcet in 1816 as very efficacious in relieving various aches and pains of rheumatic origin. It is most suited to the chronic form of the disorder; and shall there be more fully noticed.

The extract of monkshood, originally recommended by Storck, did not realize the expectations of practitioners, and fell in consequence into disrepute and desuetude. From some recent observations it seems doubtful whether it has ever had a fair trial; and that the trials have been exposed to at least two sources of fallacy.

1. It appears, in the *first* place, from the observations and rectifications of Decandolle, that the *Aconitum Napellus*, which was used in France and England, was not the species of the plant employed by Storck; and that the monkshood used by him was a variety denominated by Decandolle *A. paniculatum*, belonging to the section or species *Cammarum*.* All of them, nevertheless, are said to possess similar properties; and Geiger regards the *A. Napellus* as the most acrimonious of all. Whether this be correct or not, it is only fair to the memory of the Baron to employ the identical plant which was used in his reported experiments. All of them contain an alkaloid of considerable activity, to which the name of *Aconitine* (*Aconitia*) has been applied.

* Decandolle divides the genus *Aconitum* into four sections; *Anthora*; *Lycotonum* or Wolfsbane; *Cammarum*; and *Napellus* or Monkshood.

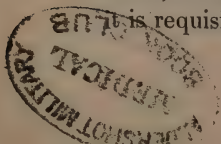
2. In the *second* place, it appears from the observations of Dr Lombard of Geneva, who has studied with attention the best mode of preparing the extract, and investigated its physiological and therapeutic effects, that the extract prepared in the usual mode by boiling water is completely inert, either in consequence of the large proportion of amidine and vegetable matter, by which its active principle is diluted and masked, or in consequence of decomposition in the reciprocal reaction of principles, in an improper mode of preparation. He accordingly prepared an extract by means of alcohol; and this he found to be extremely efficacious in alleviating the sufferings and finally removing the pains in rheumatism.

The dose of this extract is at first from one-fourth of a grain to a half two or three times daily; and it was increased in the hands of Dr Lombard to the amount of from six to nine grains in the day. Exhibited in this manner in acute articular rheumatism, its use was followed by abatement of the pains sometimes in the course of one hour, generally in the course of from twelve to twenty-four hours, and, at the latest, in the space of from thirty-six to forty-eight hours. Its physiological effects were, when given, in a considerable amount, giddiness, dazzling and hot flushes of the face, nocturnal visions and great vivacity of the impressions. It does not produce sweating, but rather puts a stop to the natural sweatings in rheumatism.

4. Acetate of ammonia has not been much given in rheumatism. It is nevertheless a good diaphoretic, and may be used after or along with venesection with great benefit. Sometimes pure carbonate of ammonia or *Aqua ammoniæ* appears to be useful in very acid states of the stomach and urine; and Dr Latham suggests that the carbonate or pure ammonia, by meeting with some acetic acid in the stomach, may be converted into the acetate, and thereby exert a diaphoretic effect.

1. *Saponaceous Tincture with one-fourth part of Opium.*—In a few cases of subacute rheumatism with symptoms of acidity in the stomach, I tried this compound in doses of one drachm two or three times daily, or by giving it at the hour of retiring to rest as an anodyne. It had a beneficial effect in relieving pain and procuring sleep, and, though productive of nausea after being taken, seemed to be less injurious than other opiates the following day.

d. *Refrigerants. Nitre.*—After considering the use of diaphoretics, it may seem singular to advert to that of refrigerants. But is requisite under this head to say that nitre has been occa-



sionally employed as a remedy in rheumatic fever. This saline substance, which was long used as a refrigerant and diuretic in febrile inflammatory disorders in general, was given to a large extent by Dr Brocklesby in the treatment of young and adult soldiers labouring under rheumatism. His method was to dissolve two drachms of nitre in a quart of water gruel, sage tea, or any other diluent, and to cause the patient to take this quantity three, four, or five times daily ; and he states that in numberless instances, stout young men, by taking at the rate of ten drachms daily for four or five successive days, perspired profusely, with great abatement of the febrile symptoms, removal of the pains and final recovery.

Few have given nitre in the large doses now mentioned ; and it seems singular that the stomach could endure so much as ten drachms of this salt in the course of the day for several successive days. It seems also singular that a salt, generally believed to be diuretic, acts on the skin when administered in large quantity. It should not be forgotten that, in large quantity, it irritates the stomach and intestines so much, that it has occasionally seemed to be followed by death.

f. Another remedy which has given rise to considerable discussion is the Peruvian bark. This medicine, it is well known, was used by Morton and others in the treatment of acute rheumatism ; but it appears never to have acquired the confidence of the profession, after the doubt expressed of its utility by Pringle, Cullen, and Heberden. Pringle admits, that, though he had some success in giving it early, he had not seen cases enough to recommend the practice ; Cullen pronounces it to be absolutely improper in acute rheumatism, and states, that he has found it manifestly hurtful in the beginning, or inflammatory state of the disease ;* and Heberden classes it with remedies which must be considered as under probation.† In opposition to this, we have the experience of Hulse and Fothergill, and the elaborate researches of Haygarth. The testimony of the two last is undoubtedly of considerable weight, as both were originally impressed with the idea so strongly inculcated by Cullen, that it must be injurious during an inflammatory state of the system, and while the blood still exhibits a buffy coat. Fothergill had seen reason, in the relaxing atmosphere of London, to accuse blood-letting, and the evacuating system in general, of protracting the disease, or inducing a fatal termination, especially in young per-

* *Materia Medica*, Vol. ii. p. 100.

† *Commentarii*, p. 347.

sons;—a conclusion in which he was afterwards supported by the testimony of Fordyce and Willan. To prevent such results, he was induced, on the recommendation of Sir Edward Hulse, to employ bark, first in his own case, and afterwards in his practice in others. It is to Haygarth, however, that the profession is indebted for a full and patient practical inquiry into the anti-rheumatic powers of Peruvian bark. At first this physician appears to have prescribed bark only after the force of the disease was believed to be subdued by blood-letting, antimonials, and other evacuants; but afterwards he ordered it without premising this mode of depletion, and at the beginning of the disease, after giving the antimonial powder or emetic tartar, merely to cleanse the stomach and bowels; and the efficacy of the treatment appears to have been great. The medicine was given generally in substance, sometimes in decoction, and rarely in tincture. The dose of the powder varied from five to sixty grains, and the repetition of this quantity from once in two to once in twelve hours. But the most common dose was from ten to thirty grains, and the usual time of repeating it was from the third to the eighth hour. Of the decoction of bark, the dose was from one ounce to an ounce and a half or two ounces, repeated every second, fourth, sixth, or eighth hour. The tincture was ordered in nine cases only, but never till fever and inflammation were much abated. If the medicine is used at all, the powder or decoction is the more eligible form, at first in small doses, and if these succeed, gradually in larger. If it disagree, or even if it does not produce manifest relief, it must be suspended, and recourse must be had to antimony, or even blood-letting by leeches or the lancet; and after the pains and febrile symptoms are thus abated it may be resumed. Administered in this manner, Haygarth contends that it not only is never injurious, but produces the most salutary effects, and removes the disease without leaving any of those chronic pains of the joints and muscles, which too often afflict patients for years, where the remedies have been blood-letting, leeches, and sudorifics.

The experience of Dr Parry led him, nevertheless, to question both its therapeutic powers and the safety of giving it while the pulse was quick, the blood sily, and the pains severe.

Where it seems to be indicated, it may be administered in the form of sulphate of quinine.

Fomentations, rubefacients, epispastics, and other revellents have been much recommended, and sometimes used in the treat-

ment of acute rheumatism. They are of no benefit so long as fever is considerable, and pain great; and the warm-bath has been ascertained to be more suited to the semi-acute and chronic than the acute form of rheumatism, and to the convalescent stage of the latter.

The safest external application, under all circumstances, will be found in the use of flannel or fleecy hosiery next the skin.

When the symptoms show that translation of the rheumatic action is to be apprehended, blisters and other irritating remedies are believed to be efficacious in keeping the disease in the joints. When translation has actually taken place, every means must be used to subdue the local action, whether seated in the brain, the lungs, the heart, or the bowels, in the same manner as if these organs had been affected originally, without previous rheumatism of the fibrous system. General blood-letting carried to such extent as relieves the sufferings of the patient, is recommended both by Dundas and Wells. Blisters, sinapisms, and other irritating applications to the skin, either in the vicinity of the affected organ, or on the parts previously affected with rheumatism, are beneficial. When the lungs or heart are affected, opium with foxglove will be useful; and when the bowels are affected, purgatives, as infusion of senna or Epsom salts, alternating with opiates, or extract of henbane (*Hyoscyamus niger*,) may be given with advantage. The exhibition of oil of turpentine also, either by the mouth or by injection, might be attended with good effect.

If the disease, when transferred to the heart, assume a chronic form, and if there be evident signs of enlargement of the organ, it should be treated, according to Wells, as if it were quite unconnected with external rheumatism. Great attention to the diet and to the state of the organs of digestion, rest, or at least avoiding all active exercise, or using that only by gestation, and the application of issues to various parts of the chest, are the most probable means of affording relief, and favouring a cure. Dr Ferriar of Manchester experienced beneficial effects from the use of tonic remedies.

It has been taught by Fothergill and Fordyce, and afterwards by several other physicians, that metastasis, especially to the heart, was more liable to take place where rheumatism had been treated by full and repeated blood-letting, than where a different method had been adopted. I can only say, that this does not accord with what has fallen under my own observation. I have

seen a considerable number of cases of the different affections of the heart, which have been ascertained by their history to have come on soon after, or at the same time with, an attack of external rheumatism. In none of these cases had blood-letting, either general or local, been employed; and the disease has been either allowed to proceed uncontrolled by any remedies, or had been treated by diaphoretics, opiates, and a blister or a sinapism.

§. XIII. Chronic Rheumatism. *Rheumatismus Chronicus.*
Rheumatismus Diuturnus.

THOUGH it be easy to distinguish between acute and chronic rheumatism, yet it is by no means easy to distinguish between subacute or what Dr Fowler calls semi-acute rheumatism and the chronic disorder. Many cases of the semi-acute disease, indeed, seem to pass insensibly into the chronic.

Chronic rheumatism may either commence at once as a primary disorder, the effect of some of the remote or exciting causes already specified, or it may be the consequence of an attack of the acute or subacute form of the disorder.

In the first case a joint or a limb is attacked without any feverishness or symptoms of general disorder, with pain, heaviness, and soreness; and the individual feels that he cannot move it without inconvenience. He feels as if something were in the part which should not be there, some foreign body or enlargement which prevents the free motion of the limb, renders it stiff, and calls his attention to it in a disagreeable manner. The pain is not in general acute; in some instances it is not felt when the limb is at rest; and it is only when the attempt to move it is made, that any soreness or uneasiness is felt. In other cases a sense of gnawing uneasiness is felt; and in others the part is cold, and is the seat of a peculiar burning sensation deep in the part, and referred often to the bones.

In other cases, when it appears to succeed an attack of the acute or semi-acute form of the disorder, the symptoms of feverishness, whether severe or slight, subside, the pains in different limbs and joints abate, and pain of a gnawing or boring character is felt in one joint or in a single limb.

Any joint or part of the frame may be the seat of chronic rheumatism. But the parts most usually attacked are the occipital or cervical region, causing *auchenodynia*; the dorso-lumbar

causing *lumbago*, the ischio-gluteal region causing *ischias* or *sciatica* or hip-gout. In some instances the shoulder or elbow, in others the knee-joint, is the seat of the disorder.

Chronic rheumatism is never attended with swelling or redness; and instead of the part being hot, it is often colder than natural, and very generally is the seat of a sensation of coldness to the patient.

Dr Scudamore, nevertheless, it is requisite to mention, does not regard this as a just ground of nosological distinction, and maintains that in some cases of chronic rheumatism considerable enlargement of the joints ensues. I believe that in general at the commencement, chronic rheumatism is not accompanied by swelling; but that in the course of the disease enlargement may take place as the effect of morbid deposition.

Though both in acute and semi-acute rheumatism the pains are in general aggravated during the night, yet this aggravation has been believed to be so conspicuous in chronic rheumatism, that it has been regarded as characteristic of the disorder. Very generally, indeed, no pain is felt during the day; but at night the pains become intense, disturbing sleep, and next morning the patient awakes from a short, disturbed, and imperfect sleep, unrefreshed, and not unfrequently fatigued, and with a sense of soreness, bruising, and debility.

As the disease proceeds, the pains undergo an abatement in their severity; but the parts continue stiff and immovable, and in general the patient remains for a considerable time lame.

A species of chronic rheumatic disorder of a particular kind deserves notice. After exposure to cold, a joint, as the shoulder, elbow, hip-joint or knee-joint, becomes the seat of slight feelings of fulness, dull gnawing soreness, and incapacity to move it or extend it without uneasiness. These symptoms proceed for weeks or months without becoming much worse and equally without becoming alleviated. At length on some additional exposure a greater degree of stiffness and soreness is felt, and the patient finds that he is unable to extend the limb without much pain, and at length extension is impracticable. Often this stiffness and soreness extend from the joint along the limb, gradually increasing the immobility of the limb, and making it the seat of severe pain.

This disorder may last for months, and it very generally ter-

minates in permanent stiffness of the joint, so that the bones of the limb remain in the semibent position.

The disease in this form, though seated first in the aponeurotic membranes, is particularly liable to pass from these to the periosteum, and gives rise to chronic action both in it and also sometimes in the interior of the articulations. It then gives rise over the synovial membrane, or rather in the place of the cartilage and it, which are removed by absorption, to a deposit which resembles a porcelain substance,—smooth, polished, and very hard, but void of the elasticity of the cartilage or the secreting powers of the synovial membrane.

It has been said that the periosteum undergoes various changes in consequence of chronic rheumatism. It may do so; but care should be taken not to confound periosteal inflammation with rheumatism.

The frequency and obstinacy of sciatica require that it should be shortly noticed by itself.

In general this approaches with a sense of pain and stiffness deep in the hip or gluteal region, and often spreading down the thigh, so as to impede the motion of the knee and ankle in walking. After this has continued for some time, the pain is often rendered more acute, and is particularly so during change of weather; and as the individual, however unable, continues to move about, it is always aggravated by motion. Though this is always represented as a variety of chronic rheumatism, yet there is no doubt that in its early and incipient stage, for days or weeks even, it preserves as acute a character as it is possible for the aponeurotic membranes to present in the inflammatory stage. As the disease proceeds, the loss of power also becomes more complete, so that at length the individual is lame, and totally unable to walk without the aid of a crutch or staff.

The seat of this disorder is various. At first there is no doubt that it affects chiefly the superficial and deep aponeurotic coverings of the gluteal muscles and part of the *tensor vaginae femoris*. Afterwards it affects the neurilema of the sciatic nerve, and is liable then to produce not only neuralgia but paralytic symptoms. Cotugno maintained, that, in a large proportion of cases, it affects the sciatic nerve solely. This, doubtless, it may do. But the disease appears most frequently to be a complex process affecting the aponeurotic sheaths, and the neurilema at the same time. This form of the disorder may be named *rheumatic neuralgia*, or *neuralgic rheumatism*.

PATHOLOGY.—Cullen was led, from the phenomena of purely chronic rheumatism, to conclude that its proximate cause is an atony, both of the blood-vessels and of the muscular fibres of the part affected, together with a degree of rigidity and contraction in the latter, such as frequently attend them in a state of atony.

This opinion is perhaps not altogether erroneous so far as relates to the state of the vessels. But it may be remarked, that there is every reason to think that the morbid action in chronic rheumatism is seated in the same order of tissues as in the acute; and that the chief difference consists in some instances in the violence of the action, and in others, in the stage to which it has attained. It is undoubtedly in the fibrous sheaths and aponeurotic membranes that this chronic action exists; and, it is mainly in consequence of their affection, in long continued cases of the disease, that the muscles which they cover or support, become stiff and unable to move the bones, so as to form what has been termed rheumatic palsy.

ETIOLOGY.—The remote causes which may produce chronic rheumatism, are not essentially different from those which are concerned in the formation of the acute disease. Cold applied in any of the modes already specified, may be followed by an attack of chronic rheumatism. Besides these causes, however, the disease is often observed to ensue after other causes, the operation of which may be solitary, but which is often aided by the concurrent influence of cold. Thus, sprains, contusions, wrenches, and other injuries are often observed to be followed by some degree or form of chronic rheumatic disorder, or at least, pain and stiffness, which present much of the rheumatic character.

The experience of Fowler led him to infer that, unlike the acute, it occurs most rarely in the months of October, November, and December, and even in June, and that in the other months of the year its occurrence is nearly equal;—a conclusion, which, if well founded, would show that its formation is less under the influence of the progress and vicissitudes of the seasons than is generally supposed. (Med. Reports, p. 270 and 274.)

With regard to the relative susceptibility of different ages, he has not attempted any further generalization than to say, that persons are most frequently affected with chronic rheumatism between the ages of twenty and fifty. (Med. Reports, p. 270

and 274.) Bardsley again inferred from extensive experience in the Manchester Infirmary, that it affects all ages from five to seventy and upwards ; more generally from twenty to forty ; but most frequently from twenty-five to thirty.

With respect to the relative susceptibility of the two sexes, the inferences of these physicians are completely at variance ;—Fowler representing chronic rheumatism as more frequently affecting males than females, in the proportion of 173 to 122 ; that it affects both sexes very frequently from the ages of ten to sixty, but more especially from the age of twenty to thirty ; and that from the age of forty and upwards, it occurs much more frequently in males than in females. In the practice of Bardsley, on the other hand, the proportion of females between twenty-five and thirty, especially married females, exceeds that of the males by more than one-third. Among the unmarried women of the lower population of Manchester, lumbago and sciatica were frequent forms of the disease after parturition ; and this is readily explained by Dr Bardsley, by ascribing it to their anxiety to return too soon to their domestic employments, or their duties at the wheel and loom. Heberden represents it as peculiar neither to sex, to age, nor to rank ; but he admits that he has seen rather more women than men afflicted with the disease.

Gonorrhœal Rheumatism.—Another peculiar cause of rheumatic attacks, sometimes semiacute, sometimes chronic, that is in duration, for, in the symptoms of pain and stiffness which take place, it is often very severe, is believed to be the presence of the poison of gonorrhœa. A person affected with this disorder may either, while the discharge continues in a profuse degree, or when it is more or less speedily suppressed, or after it has disappeared, be attacked by pain in the knee, or elbow, ankles, or wrists, or in the knee, ankle, and toes of one limb, which is much severer during the night, and proceeds with much stiffness and immobility of the joint, and sometimes redness and a little swelling of the parts. This may or may not be accompanied with quick pulse and other symptoms of fever. It is very often attended with severe rheumatic ophthalmia, in the shape of *scleritis*.

It is not known whether this form of rheumatic attack be necessarily connected with the operation of the gonorrhœal poison or not. When it appears to come on after the sudden disap-

pearance of the gonorrhœal discharge, the reappearance of the latter is not followed by any well-marked mitigation of the symptoms. In several instances also, the rheumatic disorder appears after the discharge has continued for some time, and appeared to run a certain course and then subside. Lastly, it must not be omitted, that in the instances in which the rheumatic attack had come on, the individual was at the time exposed not only to the causes of gonorrhœa, but also to the causes of rheumatism. In several instances which have fallen under observation, the patients had been in a state of partial or complete intoxication, and had been during sleep exposed to cold.

THERAPEUTICS.—Chronic rheumatism is a most obstinate and intractable disorder ; and there is scarcely in the long catalogue of human ailments a complaint, in which so many remedies are tried without permanent or material benefit. The causes of this are various. The first is the circumstance, that too often no attempt is made to oppose or remove the disease until it has continued some time, and the inflammatory action has become fixed in the aponeurotic sheaths, rendering them thick, rigid, and incapable of admitting of the free motions of the muscles and the bones. The second is, that, in attempting the removal of chronic rheumatism, the method of treatment is often inert, unsteady, and desultory.

The first indication in every case of chronic rheumatism is to endeavour to mitigate the intensity of, if not to subdue entirely, the local inflammation, by means of local depletion. The detraction of blood by cupping, or the application of leeches, is the most efficient method of depletion. The former is suited to the occipital and cervical region, the dorso-lumbar, the gluteal, and ischial ; and where it is inadmissible, as at the knee or elbow, 16, 18, or 20 leeches should be applied. This evacuation it may be requisite to repeat sundry times, especially in cases of dorso-lumbar and gluteal rheumatism ; but it is essential to know that, if it be practised early and repeatedly, it will effect a cure.

The influence of local depletion may be aided by the derivative effects of rubefacients and epispastics, or even the more permanent operation of the cauterizing derivatives, as moxa, the chemical caustics, the actual cautery, the employment of electricity and galvanism, and the use of mechanical friction and shampooing.

A second indication is to restore the motion and pliancy of

the diseased parts; and this will be effected by the use of the derivative and revellent agents already mentioned, aided by the soothing and relaxing influence of the warm bath, the hot bath, and the vapour bath, the diligent employment of friction and shampooing, and the introduction of the acupuncture needles.

A third indication consists in amending the general health, by the employment of such remedies as regulate properly the action of the alimentary canal and the skin; by the observance of suitable diet and various means of exercise.

A fourth indication in the treatment of chronic rheumatism is the abatement of pain or painful feelings, either by local applications, as anodyne epithems or rubefacient epithems, or the internal administration of anodynes.

Of the employment of these several local and general remedies it is requisite to speak in methodical order.

Of the efficacy of the several means of treating chronic rheumatism locally, various estimates have been made by different physicians; and though the testimony of different observers is somewhat discordant, it is not improbable, that the success of individual remedies depends greatly on the stage and form of the disease, to which they were applied. Thus, according to Bardsley, the warm bath, which is commended both by Haygarth and by Fowler as a remedy in chronic rheumatism, is injurious, when the disease has continued for a length of time with local and general weakness, or when protracted deep-seated pains infest the larger joints, as in *lumbago* and *sciatica*. Yet I have seen chronic cases of *sciatica* with contraction of the thigh and immobility of the limb derive their first amelioration from the use of the warm bath.

To the vapour bath modern experience is inclined to ascribe greater efficacy. When the joints are rigid and immovable, and the pain on motion severe, or when the muscles are almost paralytic; in short, in every protracted case of *lumbago* and *sciatica*, the vapour of hot water, Bardsley states, is not only a safe, but, in conjunction with other topical applications, a successful remedy. It is said to be most properly applied by means of a pipe of half an inch diameter, and a quarter of an hour is the shortest period for each application, which may be repeated every second or third day according to its effects and the sensations of the patient.

The hot-bath and the vapour-bath are often recommended to be applied for the treatment of chronic rheumatism at places

where there are natural thermal springs ; and hence, Bath and Buxton in this country, the hot-springs of Wisbaden in the Duchy of Nassau, Baden-Baden, Karlsbad in Bohemia, and of Bareges in France, with many in Italy, have been strongly recommended and much resorted to in the treatment of various forms of sciatica and other species of chronic rheumatism. Dr Falconer long ago described the circumstances and conditions under which the thermal waters at Bath ought to be employed ;* and the task has since been repeated by Dr Barlow,† Dr Scudamore,‡ and others. On the employment of the Buxton waters, a judicious little treatise was published in 1838 by Dr Robertson, Physician to the Buxton Bath Charity. § For information on the various thermal springs on the Continent, I refer to the systematic treatises of Osann|| and the late Dr Gairdner,¶ the sketch of Mr Edwin Lee,** the animated account of his own treatment at Bareges by Mr Richard Carmichael,†† and the work of Dr Granville on the Spas of Germany.

Though sometimes the internal use of these thermal waters is conceived admissible and beneficial in the treatment of chronic rheumatism, yet in this disease it is chiefly the external application that is most indicated and most usually practised. The water may be applied either as a bath, general or local, or in the form of douche. In the former mode, the patient may remain in the bath for five, ten, or fifteen minutes, or even half an hour at a time. Enfeebled delicate persons should always

* On the Bath Waters, by William Falconer, M. D. London, 1770, 12mo. Dissertation on Ischias, and on the effects of the Bath Waters on this Disease, by W. Falconer, M. D. London, 1805. 8vo.

† An Essay on the Medicinal Efficacy and Employment of the Bath Waters, with reference to the treatment of Gout, Rheumatism, Palsy, and Eruptive Diseases. By Edward Barlow, M. D. &c. Bath, 1822. 8vo.

‡ A Treatise on the Composition and Medical Properties of the Mineral Waters of Buxton, Matlock, Bath, &c. &c. By Sir Charles Scudamore, M. D., F. R. S. 2d edit. London, 1833.

§ Buxton and its Waters. By William Henry Robertson, M. D. &c. Lond. 12mo. 1838.

|| *Physicalisch-Medicinische Darstellung der Bekanntnen Heilquellen der vorzogl. Länder Europa's.* 2 Thle. gr. 8. Berlin, 1829-32.

¶ Essay on the Natural History, Origin, Composition, and Medicinal Effects of Mineral and Thermal Springs. By Meredith Gairdner, M. D. Edin. 1832. 12mo.

** An Account of the most frequented Watering Places of the Continent, and of the Medicinal application of their Mineral Springs, &c. By Edwin Lee. Esq. London, 1836. 12mo, pp. 232.

†† Observations on Sciatica and other Neuralgic Affections, and with an Account of the water of Bagnères de Bigorres, and Bareges, on their Treatment. By Richard Carmichael, M. R. C. S. Dublin, 1838, 8vo.

begin by remaining not longer than five minutes, which may be progressively augmented to ten, and if the bath produce no detrimental effects, to fifteen minutes. In general, a patient with chronic rheumatism or rigidity of the limbs will begin to derive perceptible benefit from ten or twelve baths of the duration now specified; and it may be continued, augmented, or suspended according to the effects produced.

In the latter method, or the application of the hot-spring by douche, a stream of water is made to fall from a height of from six to ten feet, and directed on the rigid part. In the hot douche of Bareges the duration of this discipline is about five minutes or ten, during which it causes at first intolerable pain. Mr Carmichael himself endured it for fifteen minutes, which was much beyond the usual time. After the douche is over, the surface should be rubbed immediately dry by warm dry towels; and the patient should be wrapped up in blankets or flannel sheets, and placed on a sofa or in bed for three or four hours, during which he perspires in general very profusely. The douche may be repeated in this manner fourteen or fifteen times, either every night, or, what would be better, every alternate night, as, in many instances, it is not only too exciting but extremely enfeebling.

Of electricity and galvanism it is not easy to estimate the real efficacy. In general they have been used either in conjunction with other remedies, or in cases which have been for a considerable time subjected to the successive operation of many different modes of treatment; and the only rule which can be laid down regarding their employment in the present state of knowledge, is that they may be tried when other means are found ineffectual.

Fowler ascertained that the application of blistering-plasters is one of the most efficacious local remedies which experience has yet discovered for the relief or removal of fixed rheumatic pains, especially those of sciatica and lumbago; and Bardsley bears testimony to the relief obtained in pains affecting the *fascia* and superficial fibres of the muscles, either by covering the affected parts with a blister, or by applying it at a little distance. Thus, in some recent and slight cases of hip-gout, a blister applied to the lower extremity of the thigh-bone proved speedily and certainly useful. (Med. Reports, p. 12.) A repetition of blisters is more tolerable to the patient, and more efficacious in removing the disease, than the practice of keeping up a constant sore, by irritating the surface with blistering ointment.

In cases of sciatica and other local rheumatic affections, in which the stiffness is attended with gnawing deep-seated pain, nothing is so effectual as the irritation of an issue by cautery, actual or potential. The moxa is the ordinary mode of applying the actual cautery, and it may be used once and again according to the relief which it affords. The potential or chemical cautery is most usually practised in this country, and the best substance for the purpose is the caustic potass (*kali purum*; *potassa fusa*), applied so as to destroy the skin for the space of a shilling or half-a-crown. In either case, the secondary inflammation requisite to throw off the eschar is so considerable, and at the same time so gradual and steady, that it rarely fails to dislodge the rheumatic action; and even if this should not be effected by a first or second application, it is the duty of the practitioner to attempt a third or even a fourth. "In very obstinate cases of sciatica," says Bardsley, "which resisted all other means, I have witnessed the happiest effects from issues; but it was often necessary to surround the joint with several of these drains, and the degree of irritation and discharge was moderated or increased according to the obstinacy of the disease, and the strength of the patient. I have seen in a hip-gout case three of these artificial openings succeed, when two have failed. Want of success is owing to the neglect of a vigorous and persevering use of the means recommended. For they have succeeded under the steady discipline of hospital practice after their failure under a feeble and desultory mode of application in private." (Med. Reports, p. 11.)

The treatment by rubefacients is an old and much used practice; and most of the quack nostrums and popular remedies for chronic rheumatism owe whatever efficacy they have, to their power of causing redness and tenderness of the skin, with some serous discharge from its surface. To this head may be referred not only the hot essential oils, as turpentine, &c., but those individuals of the siliquose tribe of plants, the parts of which containing also an essential oil, cause if applied to the skin redness and serous exudation; for example horse-radish (*Cochlearia armoracia*), and mustard (*Sinapi nigra et alba*), in the ordinary sinapism. To the same head may be referred stinging with nettles. Neats-foot oil, though an animal preparation, operates in the same manner; and hartshorn or camphorated frictions are analogous.

Another local application is mechanical friction by the brush, shampooing, or the treatment by introduction of the acupuncture needles. These remedies are chiefly indicated after acute symptoms have been subdued by suitable depletion and revulsion; and therefore they should not be employed, till after the full effects of blistering have been duly obtained.

Of internal remedies, or those which operate through the medium of the constitution, the principal are various essential oils, balsamic substances, or resinous drugs; articles containing oil and ammoniacal salt, as the cod-liver oil; preparations of antimony, preparations of mercury, preparations of arsenic; narcotic or narcotico-acrid substances, as hemlock (*Conium maculatum*), henbane (*Hyoscyamus niger*), deadly nightshade (*Atropa Belladonna*), thorn-apple (*Datura Stramonium*), monkshood (*Aconitum Napellus*), wolfsbane (*Aconitum lycoctonum* and *A. paniculatum*), yellow-flowered rhododendron (*Rhododendron chrysanthemum*), and leopards-bane (*Arnica montana*).

Of the essential oils, or resinous substances containing them, turpentine is a good example. By its power of exciting the system at large, and especially the capillaries, it has been found useful in chronic rheumatism; and as all its virtues are known to depend on the essential oil obtained by distillation, the exhibition of this, as proposed by Pitcairn and Cheyne long ago, is judicious enough. A disadvantage, however, consists in the difficulty of its being borne by the stomach, either in quantity or in such frequent doses, as is adequate to the removal of the disease. Accordingly, we find this conclusion of Cullen confirmed by the subsequent experience of Bardsley, who reports it to have always been an ungrateful medicine, and to have impaired the appetite without producing, even when continued, so much benefit as other remedies.

It is different with guaiacum. Of the efficacy of this medicine in acute rheumatism I have already spoken; it is not much less useful in the chronic disease. Originally employed for the cure of Rheumatism by Mead and Pringle, Cullen admits that its virtues are well established in chronic cases; and since his time, both Fowler and Bardsley bear testimony to its efficacy. The latter found it, in aggravated cases of general chronic rheumatism with torpor and debility, a powerful auxiliary, in as large doses as the stomach and bowels would bear; and the most generally efficacious of all the internal remedies. It is, however,

inadequate to the cure of the disease unaided by local applications; and its remedial power seemed to be increased by uniting it with laudanum, or a strong decoction of Peruvian bark.

Of the volatile alkaline salts little or nothing need be said; as they are never used alone, and when so used are never adequate to the cure of the disease.

The several forms of bitumen, rock-oil, or Barbadoes tar, have all been employed in attempting the removal of chronic rheumatic pains. Barbadoes tar, or common rock-oil (*Bitumen petroleum*), is employed both internally as a sudorific in chronic rheumatism, and also as a local derivative by friction and application. In the former case, from ten minims to half a drachm may be given three or four times daily.

Naphtha, or the more fluid oil, has also been exhibited; but the great expense of the remedy is a barrier to its use.

An empirical medicine, known by the name of British oil, extracted by distillation from the hard stone-coal found in Shropshire and various parts of Wales, has been long in use among the common people as a remedy against rheumatic pains.

The empyreumatic oil obtained abundantly during the formation of coal gas, possesses most of the qualities of the native fluid bitumen, and it might be employed with the same intention in the treatment of this disorder.

The naphtha procured from this substance by distillation might also be administered internally in cases of the disorder, in which the remedy was believed to be indicated.

The animal oil of Dippel was a remedy at one time in some repute for the same purpose. (Bulletin de la Soc. de Med. p. 93. App. ad Journal de Medecine cont. T. xvi.)

I scarcely know to what head to refer a remedy said to possess great powers, viz. the oil obtained by elementary decomposition from the livers of the cod, (*Gadus Morrhua*), and ling fish, (*Gadus Molva*.) The cod-liver oil, (*oleum jecoris Aselli*), as it has been erroneously named, was first introduced into the practice of the Manchester Infirmary by Dr Hay, one of the physicians, in 1772, in consequence of an accidental discovery of its efficacy by a poor woman in her own person, in removing chronic rheumatism, which had resisted all other remedies. It has since that been extensively and successfully used, not only in the Hospital and town of Manchester, by Percival and Bardsley, but more or less over the county of Lancashire. Its effects, according to the former observer, are slight quick-

ness of pulse and a glow of warmth over the whole body after each dose, and generally an increase of pain, followed by gradual abatement of the symptoms. It is neither uniformly laxative nor binding; but often promotes gentle perspiration, yet may be beneficial without this. In a few weeks the tongue becomes foul, the appetite is impaired, and an emetic is required, after which its use is to be resumed. The dose varies from one teaspoonful to three, and from half an ounce to one ounce and a half, twice, three, or four times daily, in cinnamon or peppermint water, warm table-beer, enveloped in white of egg, or in any other convenient vehicle. It is much more efficacious than guaiacum, and is represented by Percival and Darbey as sovereign in all cases of stiffness and immobility of the limbs and joints.* Bardsley found it very efficacious, *1st*, in the chronic rheumatism of elderly persons, where the muscles and tendons have become stiff, and the joints nearly inflexible, in consequence of the disease being induced by excessive labour, hard fare, damp, and cold; and *2d*, in women whose constitutions have been worn out by repeated rheumatic attacks after parturition, and more especially in the decline of life. In slight rheumatic cases it is of no use. According to Bardsley, if, after its use for a fortnight, the pain and stiffness of the limbs did not abate, it is in vain to persist in its exclusive use. But after its effects begin to appear, they may go on for six or eight months before they are completed. (Medical Reports, &c. p. 20, 21.)

Of this species of animal oil two varieties are found in commerce. The one is of a dark-brown colour, and exhales a rancid heavy smell, exactly similar to common whale oil. (Der Braune Leberthran.) This is in general exceedingly difficult to be taken, and is very frequently rejected by the stomach, or occasions such a sense of insupportable sickness and weight, that the patient is uneasy, until it is rejected by vomiting. This is said to be procured by the aid of heat from the livers of the animals. The other is of a lighter colour, something of a chestnut-brown or wine-yellow tint, or approaches to the colour of ordinary Malaga wine. (Der Helle Leberthran.) Its smell is less rancid and heavy, and it exhales merely the odour of newly curried leather, in dressing and lubricating which it is chiefly employed. This is said to be procured by simple decomposition without the aid

* Essays Medical, Philosophical, and Experimental. By Thomas Percival. Vol. ii. 4th edition. Warrington, 1789. P. 351.

of heat. It is more supportable by the stomach than the brown cod-liver-oil, but it is also productive of much the same feelings of nausea, weight, and oppression, which often continue until it is rejected, or passes through the stomach into the bowels.

It appears that, some years ago, Dr Kopp of Hanau conjectured that the cod-liver oil contained iodine; and he informs us in 1836, (*Hufeland's Journal*, lxxxii. iv. St. April, 115,) that this conjecture was proved by the examination of Hopfer de l'Orme to be well founded. It appears that the analysis was restricted to the red dark-yellow or Malaga wine-coloured oil. The quantity of iodine is evidently very small, and is not likely to exert much influence on the therapeutic properties of the oil. The substance, however, deserves to be again subjected to analysis, and also to more extended clinical experiment.

I have several times exhibited for the removal of chronic rheumatic pains the clear ling liver-oil; but in whatever mode it has been combined and disguised, the patients have in general been unable to persevere in its use. The most convenient plan is to combine one drachm or two with thirty minims of *aqua potassæ*, and half an ounce of tincture of senna or rhubarb or gentian, which enable the patient more easily to retain it.

The preparations of antimony or mercury recommended are the same as in the acute form. Antimonial powder, calomel and opium, either separately or together, the blue pill, friction with mercurial ointment, have each their respective advocates. Heberden remarks that a course of mercurial medicines has with great justice been suspected of bringing on something like this distemper in many persons; and recent experience has contributed to confirm the inference. This should be borne in mind by whoever proposes to exhibit mercury for curing chronic rheumatism.

In attempting the removal of the nervous ischias, or that dependent on affection of the sciatic neurilema, Trampel long ago recommended pills consisting of golden sulphuret of antimony and opium in due proportions, to be increased to such doses as the patient can conveniently bear, and continued till the pains have subsided.

The employment of arsenic as a remedy for chronic rheumatism and rheumatic neuralgia appears to have taken place first at Manchester, and we are indebted to Bardsley for the account of its results. He infers that it is only in the protracted chronic rheumatism where the vital powers are much diminished, and the

ends of the bones, periosteum, capsules, or ligaments of the joints are partially affected, that its use is likely to prove successful. Given in the usual dose of the solution carefully, and occasionally combined with opium, it appears to be harmless, and generally beneficial.—(Medical Reports, &c. p. 32.)

Of the extensive list of vegetable substances with narcotic, narcotico-acrid, or stimulating properties, which have been used with or without success in the treatment of the disorder, it is impossible to speak in detail. The most powerful apparently are the *Rhododendron* and thorn-apple (*Datura Stramonium*,) both possessed of considerable powers in rousing the action of the muscular fibres, and exciting the motion of blood through the capillaries.

Of the rhododendron the leaves are the part employed. Two drachms of the dried leaves may be infused in ten ounces of boiling water in a close earthen vessel or ordinary earthen-ware teapot, and kept near the boiling point during the night. The liquor is strained, and the whole is taken either at once or in divided portions during the ensuing day. A repetition of the remedy for three or four days in succession, generally effects a cure in the semi-acute and chronic forms of the disorder.

The thorn-apple, which was first introduced into medical practice by Baron Storck of Vienna in 1762, and was afterwards employed by Wedenburg of Upsal, and Odhelius of Stockholm, has been recommended to particular notice by Cooper and Bartram, two American writers, and in this country by Dr Marcet in 1816, who has shown that an extract obtained by boiling the bruised seeds is the most convenient mode of administering the remedy. Given in doses of a quarter, a half, and three-eighths of a grain three times daily, this extract is of singular use in alleviating the torture of sciatica and other severe pains not very well defined, but approaching to the nature of chronic rheumatism. Shortly after each dose the eyes become dim, like those of a person very drowsy, or in a state of incipient intoxication; the pupils appear dilated; languor, with more or less giddiness and unwillingness to speak, comes on; and the pulse is generally less frequent than natural. These symptoms show that the system is under the influence of the drug; but they are transitory, and disappear in about half-an-hour, leaving the pains in general sensibly alleviated.—(Med-Chir. Trans. Vol. vii. p. 551, 560, &c.)

Of such substances as sarsaparilla, sassafra, mezereon, &c., my limits do not allow me to speak.

I may mention, however, that I have more than once seen very severe attacks of rheumatic pain or chronic rheumatism in one joint, subside altogether under the internal use of the powder of the root of sarza, taken in doses of from a teaspoonful to a dessert-spoonful, two, three, or four times daily. In some of the cases in which it was given, it impaired the appetite, and was followed by nausea, and a sense of weight and oppression at the epigastric region. In others it was followed by a loose state of the bowels. But in most of the cases in which it was tried, its administration was followed by abatement and eventual disappearance of the articular pains.

The infusion of bucku leaves (*Diosma crenata*, Linn. and Decand.; *Agathosma crenata*, *Barosma crenulata*, Willd. and Hooker,) has been long in use as a remedy against chronic rheumatic pains among the Hottentots and other tribes in the neighbourhood of the Cape of Good Hope; and it is strongly commended as an efficient remedy. Half an ounce of the leaves may be infused in a pound of boiling water, and from two to four ounces of the infusion may be given twice or three times daily. If the powder of the leaves are to be given, from half a scruple to half a drachm may be exhibited three or four times daily, according to its effects. It produces gentle diaphoresis.

But the most effectual method of treatment, if the circumstances and firmness of the patient enable him to undergo it, consists in that species of regular cutaneous discharge which takes place by exercise, when the body is well covered up with flannel. Patients in chronic rheumatism are not always able to walk, and if they attempt it, do so with pain, and awkwardly. But it is not so much the extent as the effect of this mode of exercise that is to be kept in view. An interesting instance of cure effected by this plan is recorded by Dr Marcet in the person of the chemist Chenevix; and it cannot be doubted that, if every one had the same fortitude and perseverance which this eminent philosopher displayed, he would be equally successful in controlling his disease. The plan, which suggested itself to Mr Chenevix, from knowing the success of a similar mode of treatment with Vandyk, a celebrated race-horse at Newmarket, consisted in covering himself with shirt, stockings, and drawers of fleecy hosiery, over these one, two, or three pair of flannel drawers, one, two, or three flannel waistcoats, and girding five or six yards of thick flannel round the loins and hips. Wearing

over this warm pantaloons and a great-coat, he walked half-a-mile, one mile, or two miles, as his limbs could bear. After nine walks of this description an obstinate sciatica, which had literally resisted every remedy, had almost disappeared without leaving a trace of its existence.—(Med. Chir. Trans. Vol. iii. p. 310.)

§. XIV. Nodosity of the Joints. Rheumatic Gout. *Nodi Digitorum*, Heberden.

A Clinical History of Diseases, &c. ; 2. A Clinical History of Nodosity of the Joints. By J. Haygarth, M. D., Bath and London, 1805.—Observations on the Nature and Cure of Gout; on Nodes of the Joints; and on certain Articles of Diet, &c. &c. By James Parkinson; Hoxton. London, 1805. Chapter v; p. 68.

“ I have never rightly understood the nature of those tumours which sometimes grow to the size of a pea, near the third joint of the fingers. They have no connection with the gout, being found in persons who never had that disorder. They continue for life; and being hardly ever attended with pain, or disposed to become sores, are rather unsightly than inconvenient, though they must be some little hindrance to the free use of the fingers.”

These doubts, which observation first suggested to Heberden more than fifty years ago in a form rather imperfect, were first elucidated in a satisfactory manner by Dr Haygarth in 1805, in his Clinical History of Nodosity of the Joints. According to his account, the ends of the bones, the periosteum, capsules or ligaments, which form the joint, gradually increase, forming nodes which are not separate tumours, but feel as if they were an enlargement of the bones themselves. These diseased joints are generally painful, especially at night, but in a less degree than might be expected from a change so considerable. They are often sore when touched. As the disease increases, the joint becomes distorted or even dislocated; its motion is gradually more impaired. In some cases a crackling noise is perceived in the joint when in motion, particularly if seated in the neck. The skin is seldom red.

When this disease once appears, it goes on without interruption and with slight remissions. During the remainder of life the nodes continue to enlarge, impeding more and more the motion of the limb; and other joints become affected without any alleviation of those previously attacked. They are not attended with much pain or inconvenience, at least in the begin-

ning; and it is only when they have affected several joints that they abridge much of the comfort and enjoyment of life. They have, however, no tendency to shorten its duration.

Of this disease the most ordinary seat is the fingers, hands, and wrists; but no joint is quite exempt from its attacks. It occurs chiefly in women, and generally about the period when the menstrual discharge ceases; in a few rare instances before this takes place.

The disease appears to consist in a slow chronic inflammation of those parts of the capsular ligaments, which are at once connected with the bones and the aponeurotic coverings. It is this particular character which gives it the aspect of enlargement of the ends of the bones. These points of the capsular ligaments may in certain cases undergo ossification.

Nodosity of the joints is to be distinguished from chronic rheumatism, gout, strumous enlargement of the bones, capsules or synovial membrane, and from the effects of syphilis or of mercury.

The usual remedies for chronic rheumatism have been tried for this disease with various effect. The appropriate treatment, so far as our present knowledge goes, consists, after due regulation of the alimentary function, in the internal exhibition of the arsenical solution, with the local use of coverings of chamois leather in the form of gloves, wristlets, or bootkins, according to the parts affected. The warm bath, especially with salt water, and the vapour bath, will also tend to alleviate the uneasiness and stiffness.

§. XV. Gout. *Podagra. Arthritis. Morbus Articularis.*

La Goutte. Die Gicht.

De Arthritide Vera assertio ejusque curandæ Methodus adversus Paracelsistas. Auctore Tussano Ducreto Cabilunense, Medico. Lugduni, 1575. 12mo, pp. 189.—Aemilii Campolongi Medicinæ Theoricæ in Gymnasio Patavino Professoris Liber Unus, de Arthritide; Cui Accessit Antonii Sneebergeri Tigurini Enumeratio Medicamentorum facile parabilem adversus omnis generis articulorum dolores. Spiræ, 1592. 12mo. pp. 111 and 198.—A new way of curing the Gout, two Treatises, the one Medical of the Gout, &c. By Herman Busschof, senior, of Utrecht, &c. Englished out of Dutch by a careful hand. London, 1676. 12mo, pp. 136.—Gerh. Feltmanni De Dea Podagra, Liber singularis. Bremæ, 1693. 12mo, pp. 214.—Wilhelmi Ten Rhyne, M. D., Dissertatio de Arthritide: Mantissa Schematica: de Acupunctura: &c. Londini, 1683. 12mo, pp. 334.—Tractatus de Podagra et Hydrope per Thomam Sydenham, M. D. 12mo. Lugduni Batavorum, 1684, and 8vo. apud *opera omnia*. Londini, 1705, p. 395, et Lugdun, Bat. 1726. p. 429.—Martini Lister, Octo Exercitationes Medicinales, &c. Editio Ultima, Amstelodami, 1698.—De Arthritide Sexta Exercitatio Medicinalis, p. 102.—A Collection of Tracts, Chi-

rurgical and Medical. By John Colbatch, M. D. London, 1704.—A Treatise of the Gout, wherein both its cause and cure are demonstrably shown, &c. By John Colbatch, M. D., &c. London, 1704. p. 233.—Johannis Dolæi Tractatus Novus de Furia Podagræ Lacte victa et mitigata. 8vo. Amstel. 1705.—De Arthritide Symptomatica Dissertatio. Auctore Gulielmo Musgrave, M. D. &c. Exoniæ, 1703.—De Arthritide Anomala sive Interna Dissertatio. Auctore Gulielmo Musgrave, Med. Doct. Exoniæ, 1707.—Physico-Chirurgical Treatises of the Gout, the King's Evil, and the Lues Venerea, &c. By Richard Boulton, late of Brazen-Nose College, Oxon. London, 1714. 8vo, pp. 125, 382.—Observations concerning the Nature and due Method of Treating the Gout, &c. By George Cheyne, M. D., and F. R. S. London, 1720. 4to, pp. 98.—Essay on the Gout. By George Cheyne. 8vo, Dublin, 1721.—A Physical Discourse on the wonderful virtues of cold water in the cure of Gout and Sciatica. &c. &c. Translated from the Latin of Herman Vander Heyden, an eminent Physician of Ghent. 2d edit. London, 1724.—Dolæus upon the cure of the Gout by Milk Diet. To which is prefixed an Essay upon Diet. By William Stephens, M. D., &c. London, 1732.—Of the Gout in two parts, first a Letter to Sir Hans Sloane, Bart. about the cure of the Gout by oils externally applied: Secondly, a Treatise of the cause and cure of the Gout. By William Stukely, M. D., &c. London, 1734. 8vo, pp. 119.—A Treatise on the Dissolvents of the Stone; and on Curing the Stone and Gout by Aliment, &c. By Theophilus Lobb, M. D., &c. London, 1739.—An Historical, Critical, and Practical Treatise of the Gout, &c. By Thomas Thomson, M. D. some time Prosyndick of the University of Padua. London, 1740. 4to, pp. 230.—Traité de La Goutte. Par M. Charles Louis Liger, Doct. Regent de la Faculté de Medecine en l'Université de Paris. Paris, 1753. 12mo, pp. 387.—An Essay on the Nature and Manner of Treating the Gout; shewing its particular symptoms and effects, with a method proposed to render Paroxysms few, mild and short, &c. By R. Drake, George Street, York Buildings. London, 1758.—A Treatise on the three different Digestions and Discharges of the Human Body, and the disease of their principal Organs. By Edward Barry, M. D., &c. London, 1759. p. 182.—Traité Pratique sur la Goutte, par M. Coste. 12mo. Paris, 1764.—The Gout. Extraordinary cases in the Head, Stomach, and Extremities; with Physical and Chirurgical Observations on the various stages of the Disorder. By Richard Ingram, Man Midwife, &c. London, 1767.—A Treatise on the Cause and Cure of the Gout. By John Caverhill, M. D., &c. London, 1769.—A Candid and Impartial state of Evidence in the very great probability that there is discovered by Mons. Le Fevre from Liege, a specific for the gout. London, 1770. 2d edition. By Edmund Marshall, A. M., Vicar of Charing in Kent. Canterbury, 1770.—A Candid and Impartial state of the Further Progress of the Gout Medicine, being the Evidence of 1770, and part of 1771. By Edmund Marshall, M. A., &c. London, 1771.—A Dissertation on the Gout and all Chronic Diseases jointly considered as proceeding from the same causes, what those causes are; and a rational and natural method of cure. Proposed by William Cadogan, Fellow of the College of Physicians. 4th edition. London, 1771.—An Inquiry into the origin of the Gout Powder. By John Clephane, M. D., F. R. S. Read Nov. 4. 1754.—Medical Observations and Inquiries, Vol i. London, 1771. p. 126. Article 14.—A Candid and Impartial Account of the very great probability that there is discovered a specific for the Gout; in which several circumstances are laid open, necessary to be known by every gouty person. By R. Drake, George Street, York Buildings. London, 1771.—Doctor Cadogan's Dissertation on the Gout and all other Chronic Diseases examined and refuted in a letter to the author. By John Berkenhout, M. D. London, 1772.—A Candid Inquiry into the Merits of Dr Cadogan's

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THE advancing progress of my labours has brought me to the consideration of that disorder, which, next to pulmonary consumption, has formed one of the most important and arduous subjects of inquiry to physicians. From the circumstance of gout being the distemper not only of the wealthy and voluptuous, and intemperate, but also often of those in whom the mental faculties are exerted either too constantly or in too great a degree, at the expense of the health and vigour of the corporeal frame, and, consequently, from many statesmen, philosophers, literary persons, and even not a few members of the healing art having been its martyrs, it has become an object of peculiar interest to investigate the origin and progress of this disorder, to elucidate its nature, to inquire into the means of preventing it, and to attempt its cure. Accordingly, numerous authors have undertaken to explain the nature and origin of the disorder;

many propositions to prevent or to cure it have been made ; and on few diseases has a greater number of writings appeared.

The term gout is employed, both popularly and by physicians, in several different modes. It may be used either to designate the presence of an inflammatory disorder of the feet, with pain, heat, redness, and swelling, and febrile symptoms ; or it may be employed to designate the presence of various painful sensations in the feet and hands, without manifest swelling ; or it may be employed to designate various morbid sensations and deranged actions in the functions of the nervous system, of the heart and lungs, and of the alimentary canal.

Gout has been very generally since the time of Musgrave distinguished into two general forms : the Regular Gout (*Podagra Regularis* ; *Arthritis Normalis* ;) and the Irregular Gout (*Podagra Irregularis* ; *Podagra Abnormis* ; *Arthritis Anomala* .)

I. The distemper is said to be regular ; when it evinces itself by pain, heat, redness, and swelling of the foot or toes, in general after symptoms of disorder of the stomach and along with symptoms of fever (*synocha*) more or less distinct ; because these symptoms are conceived to be the ordinary mode in which the distemper betrays its existence in those whom it attacks first, before the health is very seriously impaired, and before its action has induced morbid products or changes in structure. The manner in which it makes its approach is generally the following.

The gout, when it appears in men, which it does more generally than in females, seldom shows itself before the thirty-fifth year. Instances, indeed, occur of its symptoms coming on about the thirty-third year, or even earlier, for instance, after the twentieth year ; but it is more common for it to appear nearer to the fortieth, and, in some instances, it does not appear till after that age. It is less frequent, however, after the fiftieth year.

The appearance of the pain, heat, and swelling of the feet is in general preceded for some time by a train of preliminary symptoms ; (*signa prænuncia* .) The most usual are shown in disordered or impaired action of the stomach and the skin. The appetite is impaired ; the patient has feelings of flatulence and distension, especially in the hypochondriac regions ; and acid eructations take place ; the bowels are bound, or colic pains, or diarrhoea take place ; and in some instances the patient has pain at the rectum or anus ; or a serous, sero-mucous, or sero-sanguine discharge flows from the anus.

The skin is dry, and does not readily perspire, or perspirations which previously had been habitual, are suppressed; and feelings of itchiness or tickling are felt in the skin of the back, arms, and legs. The feet also are cold, and, instead of perspiring as usual, are quite dry. In some persons it is observed, that a gold ring on the finger is blackened, as if it had been exposed to the action of hydro-sulphurous acid. The urine is sometimes pale and copious, more usually scanty, red and high-coloured; and the phosphoric salts are variable in quantity. In some instances pains in the loins are felt; the urine is much diminished or almost suppressed; and a little sabulous matter is discharged, when the secretion returns.

The sleep is often imperfect, or disturbed by dreams rather of an alarming character. The patient complains of weight or pain in the head, fulness and giddiness, but is listless, dull, spiritless, and averse to exertion, either mental or corporeal. The mind also is anxious, and the temper rather fretful and peevish.

When these symptoms, which usually appear about the close of January or the beginning of February in England, and about the end of February, or beginning or middle of March in Scotland, have lasted for one or two weeks, if means be not adopted to remove them by proper dietetic and medicinal rules, they are succeeded by some degree of stiffness and uneasiness in one or both feet, most usually in one, which is chiefly felt in walking, and is sometimes ascribed to the tightness or stiffness of the boot or shoe. The dyspeptic symptoms abate or disappear; the appetite returns, and is sometimes rather keen; and the individual feels more cheerful, and is less fretful and morose.

The sense of stiffness, however, with some degree of soreness and uneasiness, as if the foot could not be bent or the toes moved, continues and increases. The feet are still cold and dry; but that which is stiff, is beginning to be the seat of a sense of uneasy heat; and the veins are observed at the same time to be much swelled. Sometimes in the course of the evening the sense of stiffness increases, and the patient first begins to feel pain in some part of the foot, viz. either the great toe, or the base of the second and third toes. In other instances the patient retires to rest, and remains in comparative ease, with or without sleep till past midnight, between which time and the hour of three in the morning, in general, he is, if asleep, awakened

by pain in some part of the foot, either the great toe or the base of the second and third toes, at first moderate and tolerable, giving the sensation of a dislocated bone, and with a sense of uneasy heat, as if hot water were poured on the foot, but quickly becoming violent, with throbbing and intense heat. At the same time the patient, if he have not previously been chill, feels cold, and has transitory chilness, which sensations, however, are speedily followed by heat, thirst, restlessness, and other symptoms of fever. These symptoms continue increasing for about two or three hours, *i. e.* till about five or six in the morning, when they undergo a little abatement, and continue moderate during the day; but, as evening approaches, the pain and heat increase, spreading over the bones of the *metatarsus* and *tarsus* with a sense of uneasy tightness, as if they were too large for the skin and integuments, and much painful tension of the ligaments.

When the affected part is examined, there is in general at this stage of the complaint no redness or swelling; but the skin of the foot is hot, tense, soft, and smooth; and the veins of the leg and foot are much enlarged. If the patient attempt to walk or even to support his person on the affected foot, he finds that he is unable to do so without great aggravation of the pain and soreness of the foot.

These sensations continue to increase in severity as night advances, causing most excruciating torture, and invariably preventing sleep or even any rest. They are described in various modes according to the feelings and conceptions of patients. By some they are compared to the gnawing of a dog or several rats; by others to the feeling produced by a heavy weight placed on the foot; by others to a tight ligature girding the foot; and by others to wedges driven between its bones. In the exquisite form of the disorder, the pain is so acute, and the tenderness of the surface is so extreme, that the bed-clothes cannot be borne, and the motion of any one walking over the chamber is productive of suffering. The patient in the meantime tosses about in incessant agitation and endless change of posture, thrusts the foot out from beneath the bed-clothes, and thence derives a temporary relief, and tries every position in order to procure some assuagement of his sufferings. In this manner is spent the night; and towards morning, the skin becoming slightly moist, he begins to feel some mitigation of his sufferings; sleep comes on, the skin becomes more generally

moist, and he awakens about five or six hours after with the pain much abated, and finds the part swelled and a little red, with the skin soft, smooth, and velvety, a little glistening, and presenting a thick tense appearance.

The following day, and usually for three, four, or five days, the pain being moderate during the day, the patient suffers less; but it increases towards evening and during the night, and again abates as morning approaches, viz. about five or six, when the patient falls asleep, and, the skin becoming moist, he enjoys some repose and respite from suffering. This is repeated, though each successive day less violently than the first and second days; and the patient presents gradually fewer and less violent febrile symptoms. The tongue becomes clean, the dyspeptic symptoms either abate or wholly disappear, and the patient begins to have better appetite.

The pain of the foot no longer returns. The swelling of the foot at the same time gradually subsides; the veins gradually shrink to their ordinary size; the redness and tense glistening appearance of the skin of the foot disappear; and the patient finds that the foot, which had been the seat of such excruciating suffering, is restored to its former state of ease and apparent soundness.

The circumstances now described constituted what has been named a fit or paroxysm of the gout; (*Paroxysmus Podagrae.*) Its duration varies. In ordinary circumstances it extends from five to ten days, and in some instances it is protracted to fourteen days. In other instances, to be afterwards noticed, the painful heat, redness, and swelling last only for a day or two, and the patient is never confined with it.

After the attack sustained as now described by one foot, the disease may subside, while the dyspeptic symptoms disappear, and the patient enjoys better health than he did some time before the appearance of the fit. In other instances, however, when the pain, stiffness, and swelling have abandoned one foot, the patient begins to feel in the other hitherto sound, the same sensations which he experienced in that which was first attacked. The same stiffness and uneasiness in some part of the foot, the same sudden sensation of hot water poured over it, or of pricking or smarting heat, followed in the same manner by excruciating pain, gnawing, tearing, boring, girding, or splitting, with febrile symptoms, during the hours between midnight and five or

six in the morning, the same remission during the day, and the same aggravation during the evening and night,—take place in order not much less regular than in the foot first attacked. In this case, indeed, the time of accession of the symptoms is not so regular, nor is the same regularity observed either in the intensity of the symptoms, or in their duration, or in their mode of termination.

After this general sketch of the phenomena of the fit or paroxysm of gout, it is requisite to advert to several peculiarities, which, though forming essential parts of the semiography of the distemper, it is not possible to introduce into the general sketch.

In so doing, it will be requisite to say, that, as I shall often have occasion to use the term gouty inflammation, I understand by that the soreness, stiffness, and heat, followed by acute pain, swelling and redness of the surface presented by the foot of a person labouring under an attack of the disorder.

Though the foot is the part most usually attacked by gouty inflammation, and of the foot it is usually said the great toe, and that the ball of the toe is the seat of the acute pain, yet in several instances of the distemper, the gouty stiffness, pain, and inflammation may attack, and do attack other parts of the foot and leg even. Thus a site not uncommon is in the metatarsal bones, which sustain the second and third toes; and the redness, swelling, and tense glistening aspect and smooth velvet-like feeling of the skin are seated over the bones of these two toes, and spread backwards over the metatarsal region or dorsum of the foot. The swelling and redness are so considerable in some cases that the part presents the aspect as if it were going to suppurate; and I have known incisions made in such a swelled part of the foot, in order to avert this mode of termination. In most of the cases which have fallen under my own observation the metatarsal region has been red, painful, hot, and swelled.

In some instances the pain attacks the calf of the leg, or the heel, either alone or along with part of the foot. In others it attacks the knee, especially at the lower margin of the patella, forming a variety occasionally denominated *Gonagra*. In others the pain and redness appear in the hands, constituting hand-gout (*Cheiragra*,) in the wrist, or in the elbow.

The following table presents a view of the relative number of parts attacked among 100 cases of gout.

	In single accessions.	In manifold accessions.	In general accessions.
The foot,	94	75	90
The hand,	4	8	4
The knee,	2	0	2
Other parts,	0	17	4
	<hr/> 100	<hr/> 100	<hr/> 100
The great toe alone,	84	33	73
The great toe with other parts,	0	25	6
Other parts alone,	16	42	21
	<hr/> 100	<hr/> 100	<hr/> 100

Gouty inflammation in the hand is much more frequent in females than in males. It presents the same characters, though the stiffness and pain which precede the attack are less marked. The skin of the back of the hand is hot, swelled, red, glistening, tense, and in general very painful. It is also liable to occur in males engaged in sedentary pursuits; and this was the form of gout under which Milton laboured.

In general the heat of a gouty foot or hand is very considerable, and compels the patient to thrust it out from beneath the bed-clothes, and expose it to the cool air, or even to plunge it into cold water. The sensation of heat is like that of hot water or melted lead poured on the part; yet the increase in temperature, as indicated by the thermometer, is not so great as that announced by the feelings of the patient,—showing that much depends upon the morbid nervous sensibility of the part. Dr Scudamore ascertained by the thermometer the temperature of parts affected with gouty inflammation in fifteen instances; and the following are the results, as compared with healthy parts of the body.

	Heat of the sound part.	Heat of inflamed part.	Difference.
Greatest heat,	94.50	97.0	21.5
Least heat,	69.50	75.5	1.
Medium heat,	82.74	89.7	6.99

The swelling consists chiefly of distended blood-vessels in which the blood does not move so freely as it does in health. The distension and swelling of the veins is remarkable; and as this appears early in the attack, it would lead almost to the inference, that the first obstruction to the motion of the blood commenced in these vessels. The large saphena vein is in general much distended, and, with its branches, is filled with dark-coloured blood, and sometimes pain is felt along its course. In

persons of plethoric frame, but lax tissue, blood is occasionally extravasated beneath the skin, in which situation it remains for some time, giving the part the appearance of having been contused. In some cases swellings take place suddenly about the elbow or knee, or the wrist or ankle; and these seem to depend on the effusion of fluid within some of the synovial bursæ.

It was shown by Berthollet that the skin of a part affected with gouty inflammation communicates instantly to litmus-paper a deep red colour, and therefore may be inferred to secrete fluid containing a large proportion of acid.

The attack of the gouty fit is in general attended with symptoms of fever more or less distinctly marked. The patient either shivers or feels chill, and he then is unusually hot, with dry skin, and thirst; and the tongue is furred, and the urine scanty and high-coloured. The pulse is full, strong, hard, and sometimes from 86 to 90, or even above 100; in other instances it does not exceed 80, and sometimes it is so moderate as 76. But in all cases blood if drawn presents the buffy coat, and is generally strongly cupped. The serum also is abundant, and the clot extremely firm.

The state of the mind has been already mentioned. The temper is often fretful and peevish; but it is said that the judgment is clear, the intellect acute, and sometimes the fancy brilliant.

The functions of digestion, and hepatic and urinary secretion are much deranged. Besides loss of appetite, flatulence, heart-burn, stomach-ach, or colicky pains, the tongue is loaded, the bowels are bound, and often the epigastric and umbilical regions are full and distended. The hypochondriac regions, especially the right, are the seat of a sort of painful tension and uneasiness. The first alvine dejections are generally solid and dark-coloured, not unfrequently very foetid; and in some instances large quantities of dark-coloured excrement are brought away.

The urine is scanty, not above a third part of the normal amount, of a deep red colour, and voided not unfrequently with pain and scalding along the urethra. When recently voided and warm it is clear; but deposits on cooling a sediment, which is soluble in water. Its density is usually high, in general above 1025, and varying between that and 1040, according to the acuteness of the disorder. The sediment already mentioned, which is rose-coloured or lateritious, is deposited during the

whole course of the attack, and its appearance is not confined to the close or subsidence of the febrile symptoms, though at that time it is more abundant. It consists of urate of soda, the phosphoric salts, and urea mixed in various proportions. When dyspeptic symptoms and feebleness are present, a whitish magnesia-like powder, consisting chiefly of the phosphates, is deposited, or alternates with the other. In the urine of 27 among 100 cases, Dr Scudamore found albumen in the urine. This, however, is seldom joined with the rose-coloured deposit.

When the fit of gout has taken place, and terminated in the manner now described, the patient appears to enjoy better health than formerly. The appetite is good, the mind more cheerful and active, the body more agile, and the patient is delivered from many feelings of languor and oppression, with which he had previously been afflicted. In this state he may remain for two or three seasons without being conscious of any complaint or symptom, which would indicate the return of the disorder. In the course of the third year, however, after the first attack, or it may be the fourth year, generally about the same season of the year, he begins to be sensible of the presence of some of his former feelings, and at length a fit takes place much in the same manner as it did on the first occasion. This fit is, in some instances, shorter and less violent; in others it is accompanied with various circumstances, which show some deviation from the first attack. But whatever be the mode or duration of its attack, another succeeds after a less lengthened interval; in some cases the same year in the autumn, in others next year in the spring or summer. In general the intervals are longer, the younger the patient and the earlier the distemper in its course. The most common, perhaps, is the biennial or triennial attack for the space of eight or ten years; then the attacks are annual; then twice in the year; and in some severe cases the attacks are so frequent, that the patient can scarcely be said to be free from gout the whole year round. Much in all this depends on the habits and constitution of the individual. The disease then acquires a chronic character, and rarely quits the patient till it destroys him, either by complete lameness, helplessness, and debility, or by attacking the heart or the brain. Heberden, nevertheless, mentions, that he knew cases in which, after the disease had returned annually for the space of ten, twelve, fourteen, twenty, or even twenty-eight years, it at length ceased to revisit its victims for three,

ten, twelve, or even thirty years, without any detriment to the health. It has been commonly supposed, that if, after appearing two or three times, it do not return in its regular form at stated periods, it will attack the frame and undermine the health in a more insidious and pernicious form. This fact, however, may be regarded as affording evidence that these repeated paroxysmal attacks of the distemper are not necessary to the continuance of health.

When gouty inflammation has recurred several times in the feet or hands, swellings take place around the joints, consisting of concrete hard matter deposited in general immediately beneath the skin. These tumours may continue a long time without undergoing much change, and causing inconvenience merely by impeding the motions of the joints so surrounded. Often, however, they are attacked with inflammation, which proceeds to suppuration and ulceration of the skin, and there issues a white opaque fluid, while the concrete matter adhering in general to the outer part of the articular capsules presents the appearance of masses of chalk. Either without this external ulceration or with it, the secondary inflammation thus induced contributes to destroy the articular apparatus, and impair much, or even destroy altogether, the mobility of the joints. Though the deposition may take place in the feet or hands, or the toes or fingers, it seems to be more common in the latter. In this state were the hands of Milton after 1665, about the forty-seventh year of his age, when he was residing in the Artillery Walk, (*Life of John Milton*, by Dr Johnson,) quite blind, and suffering a good deal from the pain of the distemper. In those cases in which ulceration has taken place, gouty patients have been known to imitate the example of Mr Middleton, whose body was inspected by Mr Henry Watson, and who was wont, when he played at cards, to score the game with his knuckles,* and to write on the table with chalky characters. These concretions were first shown by Dr Wollaston to consist of lithic or uric acid and soda; Berzelius finding the acid to be in excess, regards them as super-urates; and Dr Scudamore and Dr John Davy have since shown that they contain a minute portion of lime, combined, in some instances, with phosphoric acid, in others, with carbonic acid, or with both.

From the manner in which these tumours are formed, being,

* An Account of a Gouty body dissected by Henry Watson, F. R. S., &c. *Medical Communications*, Vol. i. part iii. p. 86. London, 1784.

† Description of the Diseased Joints in the Museum of the Army Med. Department at Chatham. By George Gulliver. Ed. Med. and Surg. Journ. xlviii,

when first perceived, soft and elastic, and from their composition, as now stated, and the fact of an opaque fluid discharge being observed when they are exposed by ulceration, it is inferred that this matter, the urate of soda, is secreted in the fluid form, and afterwards is dried into the concrete form. It has been ascertained by the dissections of Mr Watson, Mr Moore, Dr Parry, (Vol. i. p. 249,) and the preparations described by Mr Gulliver, that this chalky matter is deposited not within the joint, but in the cellular tissue, exterior to the periosteum and the articular capsules, especially at the extremity of the bones.

When the gouty paroxysms have recurred in the same person several times, and during a series of years, it occasionally happens that the patients present symptoms of considerable disorder in the secretion of the urine, which is loaded with sabulous matter; and sometimes actual concretions are formed within the *calyces* of the kidney, and give rise to the usual symptoms of renal calculi. This change is not, indeed, constant; and in some very bad cases of gout, with gouty deposition round the joints, the kidney, ureters, and bladder have been found free from concretions or even sabulous matter. It is chiefly important for the physician to be aware of the fact, and to know, that the gouty may be associated with the urinary disorder; but that when the gouty disorder is relieved, the symptoms of the urinary affection may be aggravated, and the converse.

The regular gout I have here described in its most aggravated and exquisite form, in circumstances in which probably all the remote and predisponent causes concur in the strongest manner to engender the distemper. It sometimes happens, however, that it assumes a milder and less violent form, in which, though the patient has the stiffness, pain, and heat of the foot, terminating in swelling and redness, yet these symptoms are shorter in duration, occupying only a day or two, and not keeping the patient from moving about, and they are not accompanied with the well-marked symptoms of febrile and dyspeptic disorder already enumerated.

II. Though the semiographical history already delivered presents a view of the distemper as it shows itself in paroxysms, in the external regions and members of the human frame, it has been known, at least since the time of Musgrave, Willis, and Sydenham, that gouty action may prevail in the system without showing itself in the manifest and unequivocal manner already noticed in the external parts of the body. This inference is

founded on various facts. 1. In persons who have had one or two attacks of the regular disease in its paroxysmal form, it no longer appears in this form in the extremities, but shows itself in deranging the functions and actions of various internal organs as the heart, the lungs, the brain, the kidneys, the intestinal tube, &c. 2. In some individuals, without any previous paroxysm of external gouty pain or inflammation, the actions and functions of one or other of the internal organs are deranged for some time, and after this derangement subsides or is removed, an attack of gouty inflammation in the foot appears. 3. In the same family, the males are known usually to present the well-marked symptoms of external gout; while in the females various symptoms of disorder of the brain, the heart, or the kidneys, usually appear.

From these and similar facts, most physicians have been led to infer in the frame of gouty persons the existence of some peculiar predominant principle, from which proceed all the symptoms of the distemper. Among the humoral pathologists this was denominated peccant humour, gouty matter, arthritic acrimony. Willis, without totally denying the existence of gouty matter, appears to have been the first who inferred the existence of a peculiar gouty disposition (*diathesis arthritica*). Cullen, who denied the existence of any peculiar matter, admitted, in order to explain the phenomena, the presence of a peculiar disposition or diathesis; and the existence of this gouty diathesis has accordingly been more or less generally admitted by all subsequent physicians. The symptoms of regular paroxysmal gout are believed to be the normal or regular mode in which this diathesis betrays its existence and operation on the human frame. Whenever, in circumstances supposed to denote the presence of the gouty diathesis, it evinces its existence not by these, but by other symptoms, the distemper is denominated Irregular or Abnormal gout.

Of irregular gout (*Podagra Abnormis*,) Musgrave enumerated many forms, all of which were referred by Cullen to three general heads, the Atonic, the Retrocedent, and the Misplaced gout. These names are to a certain extent hypothetical; yet they answer the purposes of nosological distinction with convenience, if not with accuracy.

A. The gout is said to be Atonic, when the internal organs of the head, chest, and belly, present sundry symptoms of disordered action, yet without the appearance of any symptoms of external gout in the extremities. These symptoms may be

enumerated according as they affect, *a.* the alimentary canal; *b.* the organs of circulation and respiration; *c.* the functions of the brain, spinal chord, and nervous system in general.

a. Symptoms in the alimentary canal. These consist in impaired appetite, indigestion, and its consequences, as squeamishness, sickness, vomiting, flatulent distension, acid eructations, heart-burn, and pain in the region of the stomach. These symptoms are attended with pains and cramps in various parts of the trunk and upper extremities, shooting often from the former to the latter, aggravated when the flatulent distension is greatest, and always relieved by the discharge of wind from the stomach. The bowels may be and generally are costive, not unfrequently with colic pains. Sometimes diarrhœa comes on, and is violent and profuse. Occasionally the patient at the same time vomits a large quantity of green-coloured fluid, and copious discharges of the same take place from the bowels with much scalding of the bowels and rectum. (Medical Observations and Inquiries, Vol. i. p. 42.)

In some instances, dark-coloured or bloody discharges (*melæna*) issue from the intestines, in consequence of an impression on the organs containing the branches of the portal vein.

The symptoms of disorder in the stomach already specified are generally accompanied with a peculiar state of the mind. The patient is dejected, despondent, anxious, and apprehensive. He is most attentive to all his feelings and complaints, and imagines that they are indicative of the presence of serious disease or approaching dissolution.

b. In the same state the organs of respiration are affected with difficult breathing (*dyspnœa*,) or asthma, cough, and a sense of oppression, threatening suffocation; and the patient may be attacked even with symptoms of bronchial or pneumonic inflammation; or the action of the heart may be much disordered, producing palpitation, a distressing sense of anxiety, irregular or intermittent pulse, faintness (*syncope*,) or even the symptoms denominated *angina pectoris*.

c. In the head the symptoms which take place are headach, sometimes hemicranial or confined to one side, sometimes frontal or coronal; giddiness (*vertigo*;) derangement in the functions of sight and hearing, as amaurosis, brilliant flashes or spectral illusions in the former, and ringing in the ears (*tinnitus aurium*,) or imaginary sounds (*paracusis*) in the latter; lethargy, stupor, or even coma, and stertorous breathing. In

some instances these symptoms terminate in an apoplectic or paralytic shock; and cases are not wanting where life has been suddenly terminated by mortal apoplexy.

It is quite clear that in this delineation, where all or most of the symptoms now specified, may take place without the presence of a single symptom of the external inflammatory gout in the extremities, it is merely a probable inference that these symptoms owe their origin to the same general cause prevailing in the system. It is only, therefore, when the assemblage of symptoms now enumerated have either shown themselves in some connection with the painful sensations of external gout, or have undergone some relief in consequence of the presence of the symptoms of external gout, or have become unusually severe in consequence of these symptoms appearing but a little and then vanishing, that the pathologist can infer, that these symptoms depend on the gouty diathesis, and belong to the category of atonic gout.

The Atonic form of Irregular Gout has been denominated Latent Gout or Masked Gout,—a preferable name in so far as it is less hypothetical.

B. The Retrocedent, or, as it is sometimes named, the repelled gout, is slightly different. The distemper is so designated, when the symptoms of external inflammatory gout have appeared in the extremities, and, after remaining for a short time, have suddenly disappeared, while at the same time symptoms of severe and alarming disorder have taken place in one or other of the internal organs.

a. The internal organ most commonly affected is the stomach, which becomes the seat of violent burning or lancinating pain, sickness or vomiting, or extreme anxiety. In some instances this organ appears to be attacked by genuine inflammation, or at least a state of the vessels not to be distinguished from the inflammatory process.* In other instances, it gives rise to symptoms which have been regarded as dependent on spasm.† It is quite possible that what commences as spasm terminates in inflammation. The usual mode of attack is by acute piercing or constrictive pain, as if the stomach was suddenly squeezed together by a tight ligature. Then follow

* The unpublished Medical Writings of the late Dr C. H. Parry, Vol. i. p. 244-248. London, 1825.

† Practical Remarks upon Indigestion, by John Howship, Assistant Surgeon to the St George's Infirmary, London, 1825.

sickness, vomiting, hiccup, discharges of serous or sero-mucous fluid, or blood or coffee-coloured or chocolate coloured matters; and if these feelings do not speedily remove from the stomach, the patient expires in agony.

b. In other cases the heart is affected. The patient is attacked with a sudden fit of swooning (*syncope*), or with violent palpitation and anxiety in the cardiac region;—or he may present the assemblage of symptoms named *Angina pectoris*. Many gouty persons are liable, on the disappearance of the gouty inflammation from the extremities, to sudden attacks of difficult breathing, with cough or asthma (*orthopnoea*), threatening immediate suffocation. It may even cause *bronchitis* or *pneumonia*, or pleurisy.

c. Lastly, the retrocedent or repelled gout may, if it affect the brain, cause either a shock of *hemiplegia*, or apoplexy with *hemiplegia*, or complete apoplexy. On this subject, on which my limits will not allow me to dwell, I beg to refer the reader to Willis *de Anima Brutorum*, the 8th, 9th, and 14th chapters; Musgrave in his 14th chapter, *De Dolore Capitis et vertigine Arthritica*, his 15th, *de Apoplexia Arthritica*, and his 16th chapter, *de Paraplegia Arthritica*; the Observations of Whytt on Nervous Disorders, Chapter iii.; the first volume of Dr Parry, p. 504 and 506; and Howship's Practical Observations on Morbid Anatomy, Chapter I. p. 126—139.

C. When in persons believed to present the gouty diathesis, the inflammatory action, instead of appearing in the extremities, attacks one or other of the internal organs, as the lungs, the heart, the stomach, or the kidneys, it is said to be misplaced. It is easy to perceive that the examples of disorder of this kind might, without violence, be referred to one or other of the heads of atonic or retrocedent gout; for as the chief characteristic of the misplaced gout consists in the gouty action presenting inflammatory symptoms, these inflammatory symptoms might as readily be referred to the head of atonic or retrocedent gout, as several of the symptoms referred to these heads.

Several of the instances, indeed, of retrocedent gout might be said to be examples also of the misplaced distemper; for instance, the whole of that in which it affects the brain, the lungs, the stomach, or the kidneys, with any symptoms of deranged or impeded action. The instances, however, most usually adduced as examples of misplaced gout, are when, in persons of gouty diathesis, it gives rise to symptoms of pneumonic or pleuritic inflammation,

symptoms of gastric or intestinal inflammation, symptoms of renal inflammation or affection of the bladder or rectum. Whenever, therefore, in the gouty, the symptoms of renal disorder with suppression of the urinary secretion appear, or pain, stranguery, and a mucous or muco-purulent discharge from the bladder or urethra take place, or pain at the rectum, with hemorrhoidal swelling, or hemorrhage from the bowels ensue, it is believed that, in such circumstances, the arthritic action is misplaced.

The inflammation of the urethral mucous membrane, which is a true *blennorrhœa*, is one of the most extraordinary and important examples of misplaced gouty inflammation. It resembles both in the sense of scalding and uneasiness, and in the character of the discharge, common virulent gonorrhœa so closely, that instances of mistakes having been committed, in ascribing it to that cause erroneously, are recorded. It has been noticed by Dr Clerk (*Essays Physical and Literary*, Vol. iii.), who met with several instances of it; by Stoll; and forms the subject of a dissertation by J. Andrew Murray of Upsal, who fully and carefully described it in order to prevent such errors from happening. The practitioner will, therefore, bear in mind that a puriform discharge from the urethra may be the effect of arthritic action.*

Practically speaking, the difference between misplaced and repelled or retrocedent gout is always difficult to be determined. Cullen himself seems to doubt whether the gouty action ever produces inflammation of an internal organ, without having previously produced it in the joints, or whether the inflammation of the internal parts can be always distinguished to be the effect of translation from the external parts.

TERMINATIONS AND EFFECTS.—The terminations of arthritic action may be understood from what has been already said on the course of the disease. These terminations may be distinguished into two orders; 1st, the terminations of the disorder in the regular form; and, 2d, the terminations of the disorder in the chronic stage and irregular form.

Regular gout terminates usually in health; but, as the paroxysms return after short intervals, it is liable to terminate in chronic gout with deposition of chalky matter around the joints, or in some one of the irregular forms of the disorder.

The irregular forms of the distemper again are liable to ter-

* J. Andræ Murray *De Materia Arthritica ad verenda aberrante Disquisitio*. Upsala, 1785, apud Opuscula, Vol. ii. p. 415. Gottingæ, 1786.

minate in cerebral hemorrhage, inflammation, or softening, producing apoplexy or palsy; in hypertrophy of the heart, or ossification and degeneration of the mitral valve or the semilunar valves; in degeneration of the aorta or its semilunar valves; in fatal spasm of the stomach; in inflammation of the gastric mucous membrane, or of the intestinal mucous membrane; in *nephritis*; in hepatic disorders; and in extensive disease of the arterial system.

MORBID ANATOMY.—The appearances found in the bodies of those who have laboured under gout vary according to the form of the distemper by which they have been afflicted, and according to the length of time during which the disease has lasted.

In general, chalky matter or chalky concretions (*tophi*) are found deposited beneath the skin, between the fibres of the muscles, on the outside of the capsular and articular ligaments, over the periosteum, the tendons, and the tendinous sheaths, and sometimes within the tendinous sheaths, and, in short, in the subcutaneous cellular tissue. The articular tissues also, as the fibrous capsules and ligaments, and likewise the synovial sheaths, are observed to be more or less thickened, and to have lost their pliancy, and to have become rigid and fragile. In some joints the inner lining membrane alone is diseased; in others the external coverings are incrustated with calcareous matter. In persons in whom the motions have long ceased, the muscles are shrunk, pale, and atrophied; the tendons become rigid and brittle, and at length are almost wasted.

The periosteum, the cartilages, and the bones are seldom affected, unless in consequence of chronic gout coming on primarily, or gout which has become fixed in the joints alone. Wenzel mentions that, in a young man destroyed by apoplexy after the first severe accession of gout, the lower cartilages of the thigh-bone were slightly streaked. It appears, also, that the cartilage becomes at first perforated, reddish and slightly spongy, and afterwards disappears with the synovial membrane by absorption. The fluid of the joint also becomes opaque and thick like cream, a change which is often if not always attributable to the presence of lithate of soda or the tophaceous matter. The extremities of the bones then being denuded are softened, reddened and enlarged, causing more or less deformity; or the surface from frequent attrition, becomes smooth and porcellanoid like polished ivory; or they present an unequal tubercular-look-

ing surface. In some long continued cases they become carious, and are absorbed or are brittle.

In the irregular forms of the distemper, the appearances found depend on the manner in which the fatal termination takes place.

When the patient dies comatose, or after apoplectic symptoms, part of the brain is found either in a state of red softening, or containing recently effused blood, or with thickening of the membranes.

When death has taken place after difficult breathing, palpitation and pain in the region of the heart, either that organ is found enlarged with marks of osteo-steatomatous degeneration of the mitral valve or the semilunar valves, or the pericardium is found adhering to the heart. In several instances also of this kind, where the dyspnœa has been long continued, serous or sero-sanguine fluid is found within the cavity of the pleura, forming symptomatic or secondary hydrothorax. Where death is very sudden by *syncope*, the substance of the heart is in general atrophied.

When death has taken place after violent pain in the region of the stomach, followed by sickness and vomiting, it does not always follow that the traces of any perceptible lesion in the organ are left after death. According to Dr Hooper, as quoted by Mr Howship, even in cases of retrocedent gout, in which the individual was suddenly attacked with violent pain referred to the stomach, and vomiting of coffee-ground-like matter, followed by speedy death, yet he found the stomach uniformly relaxed, presenting only patches of increased capillary vascularity on its internal surface. In cases of this class, where so little is found after death, Mr Howship is inclined to refer the fatal event principally to spasm.

Something different is the account of the effects of gouty action on the stomach given by Dr Parry in the case of a member of the profession, who, at the age of 47, after two fits of gout in the lower extremities, each succeeded by rheumatism in the hands, elbows, and neck, was attacked with sickness and vomiting of red fluid, and pain in the stomach terminating fatally. He found in the large end of the stomach about one ounce of reddish brown opaque fluid, the same as that rejected by vomiting; the villous membrane of the stomach much diseased; the cardiac portion more or less inflamed, indicated by dark-red spots and patches of various sizes, the intervals diminishing towards

the great arch, where the villous coat was altogether red; and the diseased surface every where effusing blood.

These are marks at least of extreme hemorrhagic or vascular congestion; and the only question would be, whether they were the result of inflammation, or a morbid action in the vessels,—or spasms, or a morbid action in the muscular fibres?

As to other appearances, they are very generally those of the disease, the appearance of which the gouty action has assumed.

This list might, indeed, be much enlarged, according to the ideas entertained by physicians in the relation between gout and various other distempers. Thus Musgrave speaks of abscesses of the *pleura*, the *peritonaeum*, and of the intestines, and even ascribes to gout the abscess round the anus, which usually terminates in fistula; Stoll speaks of gouty hæmoptysis, gouty consumption, gouty *acne rosacea*, and gouty leucorrhœa; and Portal ascribes to gout many lesions which may take place in the organs and membranes of the human frame, with or without that cause. In this view, however, it is difficult to say what disorder or lesion is not to be ascribed to the operation of gout. The chief point for the practitioner to know is, that gout in a masked, latent, or disguised form, may assume the appearance of various other disorders.

DIAGNOSIS.—Gout is liable to be confounded with ordinary inflammation or erysipelatous inflammation of the foot or leg; with inflammation of the synovial membranes, when in the joints; with chronic inflammation of the capsular ligaments; and with rheumatism acute, semi-acute, or chronic. The distinction between gout and the latter tribe of disorders is supposed to be most important, and has exercised the ingenuity of Sydenham, Stoll, Cullen, Heberden, and Scudamore. The circumstances upon which a diagnosis may be founded, have been specified more clearly perhaps by Heberden than any that have either preceded or followed him; and his distinctions should therefore be known by the practitioner.

According to this physician, in gout, the first attack, consisting of several fits and remissions, is wholly confined to the first joint of the great toe, or at least to some part of the foot; and the fit does not usually last above ten days or a fortnight.

The pains are sometimes preceded either by a considerable degree of fever, or by slight feelings of illness, which for a few days render the sleep less sound, or in a small degree abate the vigour of the appetite, digestion, spirits, and strength. These

precursory and concomitant symptoms, nevertheless, are not uniformly observed.

The part affected is coloured with a deep redness, and is so intensely pained as hardly to bear the gentlest pressure.

The pains are almost always found to return within a few years, and after a few visits to make their returns oftener, and then stay shorter, extending by degrees to every part of the body, which they enfeeble or harass with chalky sores, or render useless by the effects of frequent inflammations in destroying the motion of the joints.

They are apt to desert the limbs and fall upon the stomach, the lungs, the heart, the brain, or the kidneys..

They seldom, if ever, attack any who are not past the years of puberty.

Lastly, they are for the most part transmitted to the descendants of those who have suffered in any considerable degree.

In rheumatism, on the other hand, the pains do not begin in the foot preferably to any other part; they come on suddenly and without preliminary symptoms; and they seldom continue long in the same place, but are perpetually wandering over the whole body, even during the first fit, which has been known to last for several months.

In rheumatism, the chief pain arises from moving the part affected, which while at rest gives for the most part rather the sensation of lassitude than of anguish and torture.

The discolouring of the skin, if there be any, is not a deep-red, but rather a faint blush.

A severe fit of rheumatism often happens without ever returning through a very long life, and hardly ever makes periodical returns like the gout.

Rheumatic pains more rarely desert the muscles and joints, to seize upon the vital organs. On this subject, I have only to refer to what has been already said on translated rheumatism.

Lastly, very young children may labour under violent rheumatism; and particularly those who have in them by inheritance the seeds of gout, with which they are to be afflicted when they arrive at manhood.

These are, according to Heberden, the principal distinctive characters of the two distempers; but he admits that there are cases in which the criteria or proper signs of both are so blended together, that it is not easy to determine whether the pains belong to gout or rheumatism.*

* *Commentarii de Morborum Historia et Curatione*, Chap. ix. p. 52-53.

In the irregular or anomalous form of the distemper, the diagnosis is greatly more difficult. For, as it is often disguised under various dyspeptic or nervous symptoms of the atonic state, or the affection of the brain, heart or other internal organs of the retrocedent and misplaced state ; it is difficult to determine whether the symptoms originate in the arthritic diathesis, or are independent of it.

Others, again, like Barthez and Chomel, regard rheumatism and gout as mere kindred varieties of the same distemper ; and consequently believe that all attempts at diagnosis, further than to mark the parts affected in each, are vain and superfluous. Hence pathologists of this school term gout articular rheumatism.

ETIOLOGY.—In one sense the origin and developement of gout may be said to be well understood ; but in another sense, the causes on which the formation of the disease depends, are beset with contradiction and involved in obscurity. I shall study to state as briefly as possible what is ascertained.

Gout is very generally a hereditary distemper, or, to speak more to the matter of fact, a distemper, the disposition to which is transmitted from parents to children. The disposition to gout may be derived from either parent, but is more frequently taken, it is said, from the father, and from male ancestors in general, than from females, in the proportion of 76 to 44.

In ordinary instances of the hereditary transmission of gout, it affects the males in preference to the females of the family ; but in others, while the males escape altogether, the females suffer from the distemper in various shapes, viz. pains of the ankles and feet, pains and swellings of the hands, violent pains in the stomach or loins, with affection of the kidney, and urinary secretion, and paralytic disorders. In some instances of nodosity of the joints, it is possible to trace this disease, when taking place in females, to the operation of the gouty diathesis.

In various cases of the hereditary transmission of gout, the distemper passes over one, or even a second generation altogether, and appears in the third or fourth generation, or sometimes passes only by the offspring of sons and not of daughters. The converse has also been observed to take place.

When the disease appears in females, it is generally after the period of the cessation of the menstrual evacuation. According to Cullen, however, it may happen to females of robust and full habit long before the cessation of that secretion ; and he further

states that he found it taking place in females whose menstrual evacuations were more than usually abundant.

It is an old observation, that gout rarely attacks eunuchs, unless those who are corpulent, eat much, and spend indolent lives.

It has been said that the men most usually attacked with gout are those endowed with large and robust frames; with large heads; men of full corpulent habits, (Sydenham); and those in whom the *rete mucosum* is thick and coarse. It is occasionally, however, seen attacking the lean and slenderly made.

The disposition to gout, though often dependent at least on hereditary peculiarities, may nevertheless be acquired; and the circumstances under which it is acquired, have occupied much the attention and investigation of physicians. In this inquiry, it is admitted that if the predisposition exist, though in a latent form, it is more readily called into action under the operation of certain remote causes.

The chief remote causes which are believed most efficient in the production of the gouty disposition are habits of full living or indulgence in the pleasures of the table; the habitual and free use of fermented liquors, especially wine; an inactive and indolent mode of life, especially as to corporeal exercise; the habit of study or mental labour immediately after taking food; premature or excessive indulgence in the sexual passion; much or long-continued mental labour, especially if accompanied with much anxiety, or engaged in matters causing mental solicitude; and protracted so as to interfere with the hours of sleep; and lastly, depressing or melancholy passions and emotions.

It is unnecessary to consider the operation of these several causes in detail; but a few remarks on certain points may be useful.

All are agreed as to the influence of full living, especially if accompanied with the free and habitual use of wine, and indolent, sedentary habits. Some, however, have maintained that one class of wines may be drank with impunity; while the use of others is highly favourable to the production of gout. It is often said, for instance, that the mellow, generous wines, as Sherry and Madeira, are less productive of gout than the sharp acidulous wines, as the Rhenish, or the French, as Claret and Champagne. This is, at best, a difference in degree merely. The latter are more acidifying, and may impair the action of the stomach; but the former being stimulating, and at the same time acidifying, are not less hurtful. All that can be said is

that both are bad. Madeira was supposed by Sydenham to be less productive of gout than other wines. It may have been, at the time when Sydenham wrote, less strong than it is usually at present; but it is not fair to conclude that it is on that account less injurious. Cyder is, in general, when freely used, productive either of gout or stone.

At the same time, though the free use of these articles is liable to induce the gouty diathesis, avoiding them will not in all instances prevent the disposition to the disease and the distemper itself from being developed. It is indeed well known, that persons habitually temperate in the use of both food and drink are attacked with gouty symptoms; and, as this takes place chiefly in persons of sedentary habits or literary pursuits, in whom great and almost incessant mental labour precludes the sufficient use of corporeal exercise, the fact shows very clearly the powerful influence of these habits of mental application alone in giving origin to the disorder. Passing over such persons as Sydenham, Boerhaave, and Linnæus, all of whom, though of temperate habits, suffered more or less severely from gout, no man lived a more temperate or abstemious life than Milton, and yet Milton was in the greatest torture from this distemper, and his hands, as already mentioned, encrusted with chalky concretions, before he reached his fiftieth year.

The effect of literary pursuits, mental application and mental solicitude, is also shown by observing the exemption enjoyed by those who are much occupied in corporeal labour, and little or not at all in mental exertion. The peasantry, labouring persons, soldiers, and seamen, seem to enjoy a complete exemption, at least from the external paroxysmal forms of this disorder; and when their habits are marked with indulgence and intemperance, they do not engender gout so much as diseased kidney, stone, diseases of the heart and arterial system, and diseases of the liver and of the brain. From the observations of Sir Gilbert Blane, it appears that, among 3800 patients admitted into St Thomas's Hospital, he observed not a single gouty individual; and among 10,000 admitted into other hospitals, scarcely five were observed.

It is well known, however, that occasionally inn or hotel-keepers, waiters in hotels, coachmen in wealthy families, and similar servants, are attacked with symptoms of gout. This fact again demonstrates the influence of indolent habits with excess in the use of food and drink. Most of these persons not only

eat animal food very freely, but are frequently sipping ale, wine, and similar liquors.

It may be proper to remark, that all the causes now mentioned tend to produce congestion in various internal organs, to subvert the equal distribution of the blood, and to cause some tissues and organs to receive more than their just proportion, while others receive less. This state has been often denominated in a vague general manner *plethora*, or fulness (*plenitudo*), ($\pi\lambda\epsilon\theta\omega\rho\alpha$), understanding thereby an inordinate fulness of the vessels with blood, and undue distension (*plenitudo ad vires*). * It may be justly doubted, nevertheless, whether this state ever takes place, or can exist in the human body for any time; and it seems more rational to infer that, without being augmented in quantity, it may be unequally distributed through the several organs and tissues.

The effect of many of the circumstances already specified is further to retard the motion of the blood in various sets and orders of vessels, and thereby to induce local congestion at the expense of the different secretions, and to the detriment of the circulation generally throughout the frame. These local congestions from subverted equilibrium take place, *a.* in the intestinal canal, especially towards the lower end of the ileum and the colon; *b.* in the liver; *c.* in the brain and its membranes, or the spinal chord; *d.* and in the arterial tunics in general.

Besides the general and habitual or long continued operation of the circumstances already specified, it is observed that, though a fit of the gout often comes on spontaneously, or without the manifest application of any external cause, yet it is sometimes observed that the fit takes place soon after the patient has been subjected to the action of one or other circumstances tending to derange the function of the alimentary canal, the functions of the skin, or to change the distribution of the blood in the extremities. To this head may be referred excess in the indulgence of the sexual appetite; excesses in eating, or the use of improper articles of food, causing symptoms of indigestion; excess in the use of stimulating and intoxicating liquors, especially if acescent, as ale, cyder, or wine; unusual or intense

* The mathematical physicians admitted three forms of *plethora*; 1. the *plethora ad spatium*, or that which proceeds from constriction and rigidity of the vessels without increase in the quantity of blood; 2. the *plethora ad molem*, or that which is supposed to proceed from expansion or rarefaction of the blood, or increase of its volume; and 3. the *plethora ad vires*, or that which is supposed to proceed from actual abundance or excess of blood.

application to study or business, especially if accompanied with night watching and abridgement of the proper time for sleep ; interruption to the usual corporeal exercises and means of relaxation ; the sudden transition from a very full to a very spare diet ; excessive evacuations ; the free use of acid or acescent articles of food and drink ; cold applied to the extremities ; and in some instances a wrench or the bruising produced by a tight shoe or boot.

All these circumstances now enumerated have been regarded as occasional or exciting causes. It must be observed, however, that they may by long continuance become capable of engendering the disposition to the distemper.

PROGNOSIS.—The prognosis in gout is important in estimating the value of human life. In its regular form the disease though painful, seldom proves fatal ; but in the anomalous forms either of latent or repelled gout, it may suddenly destroy by acting on the heart, the stomach, or the brain, or it may terminate in diseases either of the heart or brain, which are not less certainly though more slowly fatal. According to Sir Gilbert Blane, 50 among 1000 gouty persons die, while during the same period of the eighteenth century, among 1000 persons destroyed by all sorts of diseases, the bills of mortality showed only two persons dead of gout. In this comparison, however, I fear that no account is taken of the many cases of apoplexy, palsy, and diseased heart, by which life is usually terminated in those of gouty habit. Upon the whole, gout must be regarded as a dangerous disease, and one which tends not only to shorten the duration, but to diminish the security of life. When the first symptoms of regular gout appear, they should always be viewed in the light of benevolent warnings to the patient to alter his mode of life, to diminish his allowance of food and drink, and, above all, to alter the materials of his diet, to increase the amount of his exercise, and to resist as far as he can the disposition to indolent or inactive habits. It is observed that persons who persevere in their usual mode of living, are either rendered lame for the short period which they live, or are destroyed by apoplexy or disease of the heart, or become paralytic or insane. Life, in such circumstances, is rarely prolonged beyond the fiftieth year.

PATHOLOGY.—Few subjects have so much exercised the ingenuity of physicians as the pathology of gout ; and not

only have all those, who have been distinguished as the founders of systems, laboured with different degrees of diligence and success, in establishing peculiar hypotheses to explain the nature of the disorder, but many individuals, without any wish to support a particular system, have endeavoured to penetrate the mysteries of this distemper. It is unnecessary to advert to all the doctrines taught on this point; but a few I must notice.

Galen had ascribed the phenomena of gout to the superabundance of fluids, and to morbid fluxion, the latter an expression of the fact which has been admitted by almost all sects. This doctrine Paracelsus and his pupil, Van Helmont, altogether rejected, and ascribed the phenomena of the distemper to acrimony and acidity of the synovia. This notion was opposed by Tussanus Ducretus, who endeavoured to revive the Galenic principles, and Sennert who, though he admitted the existence of acid, did not allow that it operated as represented by Van Helmont. Fernel, rejecting all previous doctrines, attributed the phenomena of gout to the presence of phlegm, which descending from the head to the articulations and extremities, causes these uneasy and painful disorders. This doctrine was again opposed by Aemilius Campolongus, who defended the ancient opinion of redundant fluids and morbid fluxion or determination, with imbecility of the articulations.

Previous to the time of Willis and Stahl, therefore, the medical world seem, on the subject of gout, to have formed two bodies, one maintaining the old Galenian opinion of morbid plenitude and determination, and the other espousing in some shape the idea of morbid matter or acrimony.

Willis appears first to have thought the doctrine of morbid matter not only gratuitous and unnecessary, but also inadequate to explain the phenomena, and accordingly adduces against it various arguments, but concludes that the phenomena were produced by fermentation of fluids not easily miscible. Notwithstanding the latter assumption, however, he is the first who maintains the existence of an arthritic disposition, (*diathesis arthritica*,) and demonstrates its evidence by various facts.

Stahl, about the same time or soon after, denied the existence of all morbid matter in the gout, and undertook to show, in accordance with his general pathological principles, that gout was nothing else but a painful spasmodic movement or agitation (*motitatio*), deriving its first origin from the external hemorrhoids and intense varicose compression of the blood, but eventually, part-

ly from not getting vent, continuing with remarkable obstinacy; partly through habit becoming so inveterate, as afterwards to assume more frequently an active form, even in consequence of slight occasional causes, as mental emotions, which he imagined aggravated those motions not only speedily, but even violently, far beyond the proportion of the subject or the object.* Stahl further imagined gout to be nearly allied to rheumatism, and ascribed the gouty inflammation to an effort or impulse of the soul to remove from the system some noxious obstruction in the vessels.

Hoffmann, who assumed the simultaneons or alternate predominance of atony and spasm, fancied, in explaining the formation and phenomena of gout, a strange mixture of excess of saline principles in the fluids, and maintained that acids were formed, and, uniting with earthy particles, gave rise to the formation of gout, rheumatism, and other similar affections.

It must be remembered that these speculations, however contradictory and unprofitable, were in truth much valued in their day; and amidst the singular confusion of fancy, fact, and assumption, there runs a slender vein of truth and nature, which Boerhaave attempted to separate and demonstrate.

Amidst this assemblage of fancies, Cullen, in imitation of Stahl, discarded at once, as a violent assumption, the doctrine of a peculiar gouty matter, and thereby rendered a great service to the pathology of the distemper. The arguments are given in the First Lines; and it is unnecessary to reproduce them here. It is sufficient to remark, that the fact which had at first suggested and had afterwards rendered plausible this hypothesis, viz. the secretion and deposition of tephaceous or chalky matter round the joints of gouty patients, was quite as incompetent to demonstrate the existence and operation of a peculiar matter as the formation of lymph, or purulent matter, or ordinary inflammation. It is the effect of a morbid action, but it is not that morbid action itself. The hypothesis was indeed a violent and gratuitous assumption, resting either on no facts, or on statements which were erroneous, for instance, the alleged contagiousness of gout. The hereditary transmission also does not prove the presence of a peculiar matter, but merely of a peculiar diathesis or disposition.

* Georgii Ernesti Stahl et J. Conr. Tieffenbach de Podagræ Nova Pathologia Disputatio. Halae, 1704. Halleri Disp. Tom. vi. p. 477.

Cullen having discarded the old hypothesis of gouty matter, substituted in its place one certainly more in accordance with the principles of modern physiology and pathology. Inferring from the facts that gout is a disease of the whole system, and depends on a certain general conformation and state of the frame, and that the state of the system depends on the condition of its moving powers, he further concludes that gout is an affection of the nervous system, in which the primary agents of motion are lodged. The occasional or exciting causes, he conceived, were such as acted on the nervous system; and most of the symptoms of the atonic and retrocedent gout he regarded as affections of the same system.

He observed, in the third place, that gout evinces a peculiar tendency to affect the stomach. Many of the exciting causes act first on that organ; the paroxysms of external inflammatory gout are preceded by symptoms of disorder in the digestive function; and the symptoms, both of the atonic or latent gout, and often those of the retrocedent gout, are principally affections of the same organ. From these considerations, he inferred that a certain balance or equilibrium subsisted in the healthy state, between the state of the internal organs and that of the external parts; and, in particular, that the state of the stomach is connected with that of the external parts, so that the tone of the one may be communicated to the other.

Cullen next inferred, that, in a certain class of persons, there is a vigorous and plethoric state of the system, with which, at a certain period of life, a loss of tone in the extremities is liable to be conjoined. Though this is communicated to the whole system, it appears most in the functions of the stomach. The influence of the nervous system is such, that while it is entire, it attempts to restore this equilibrium by exciting an inflammatory affection of the extremities, after the continuance of which for some days the tone of the extremities and of the whole system is restored, and the patient recovers his usual degree of health.

This adequacy of the nervous system to produce the inflammatory symptoms in the extremities and the actual occurrence of the inflammatory process constitutes Regular gout. Its inadequacy constitutes Irregular gout. Its total inadequacy forms Atonic or Latent gout; its partial adequacy to produce some, but not complete, external symptoms constitutes Retrocedent

gout; and when its adequacy is believed to be complete but misdirected, it forms the variety of the distemper named *Misplaced gout*.

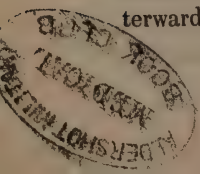
This hypothesis is plausible; but had the author stated that the whole alimentary canal was disordered; that the textures themselves had the power of restoring the equilibrium; and that the vascular system was as much concerned as the nervous, it would have been more complete.

This question on the pathological nature of gout has occupied the attention of several authors since the time of Cullen; and opinions of various merit have been proposed and supported by different physicians. To omit the humoral pathology and acrid matter of Williams, (6,) the vague reasonings of Scott about acute "irritability of the nervous system, loss of perspiration, and extravasated bile;" (132, 134, 137,) and of Gardiner, who, in 1792, revived the old notion of gouty acrimony or morbid matter in the circulation, (19, 21, 23, 27, 28, 29,) we find Jeans about the same time ascribing it to general debility, debility of the alimentary canal, and the sympathetic or nervous connection between this organ and the joints; (22, 24, 36, 38).

Soon after Forbes, (1787-1793) remarking the close connection between gout and gravel, and the tendency of the disease to form concretions, ascribed it to the presence of *Lithisiac*, or what has since been named *uric acid* in the blood, which was liable to periodical deposition, through the medium of inflammation, in organs whose vessels are of the smallest order, and whose disposition is inert, for example tendons and ligaments, (sect. iv. p. 78-80); and the material cause of this deposition was, according to his idea, the power of some stronger acid either taken into the stomach, or formed in the process of digestion, (87).

About the same time, Berthollet had advanced an opinion not dissimilar with regard to the presence of *phosphoric acid*. From numerous observations this chemist concluded that *phosphoric acid* is more sparing in the urine of the gouty and the rheumatic, than in that of healthy persons, and that during a paroxysm it became more abundant, and equalled the proportion found in the urine of the most healthy persons; and he therefore ascribed gout to the retention and accumulation of this acid, and its diffusion through the system.* The reverse of this was afterwards maintained by Richerand, who observes, that, on the ap-

* *Journal de Medecine*, Juin 1786, p. 476.



proach of gouty fits, the phosphoric ingredients of the urine diminish, and seem to be conveyed to the joints to produce their arthritic concretions. Less definite is the opinion of Parkinson, another pathologist of the chemical school, to whom "the proximate cause of gout appears to be a peculiar saline acrimony existing in the blood, in such proportion as to irritate and excite to morbid action the minute terminations of the arteries in certain parts of the body."—(Observations, &c. p. 3.)

Opinions somewhat different were maintained by Latham, Wallis, Hamilton, and Kinglake. The first of these authors denied the existence of inflammation in gout, and, believing in the intimate connection between it and rheumatism, the seat of which he placed in the exquisitely fine and slender radicles of the lymphatic vessels, (9), he in like manner ascribed gout to irritation of the lymphatics, by unassimilated and imperfect chyle, subsequent obstruction and constriction, followed by pain, heat, redness, and tension (58). This opinion was soon opposed by Wallis, who, regarding the preliminary symptoms as not inflammatory, but as "affections of the nervous system," arising from the sedative operation of gouty acrimony, or a specific morbid humour, ascribed the phenomena of gout to "stimulus, inducing immediate pain, tending by a law of the animal economy to the small joints and the surrounding ligaments," followed by the usual symptoms of inflammation. (P. 76). In 1804, Kinglake advanced the exclusive and partial hypothesis, that "gout is a greater or less degree of inflammatory affection of the ligaments and tendons, induced by distempered excitability of those parts from various causes." The question at issue was utterly misunderstood by Hamilton of Lynn Regis, who concluded that "the only original or proximate cause of gout in otherwise apparently sound constitutions, is hereditary descent," and yet, with unaccountable inconsistency, admitted the existence of a "real morbid fluid, of a subtile nature, which possesses the whole system, ready to be developed, diffused, and brought into action." (77—80).

Lastly, Sutton, remarking the derangement of the alimentary functions with which the gouty fit is preceded, and the great relief obtained by purgative medicines, supposes that the principal and exciting cause resides in the alimentary canal (p. 220;) while Guilbert and Hallé, combining this with the doctrine of

Latham, make gout consist in derangement of the functions of digestion and perspiration, followed by distension or plethoric obstruction of the lymphatic system, with improper materials, which became a source of irritation wherever they are deposited; (Johnson's Translation, p. 55, 56, section 31).

Of the several opinions now enumerated, it is to be said that not one is absolutely and entirely wrong, nor is any one altogether right. All of them are objectionable, inasmuch as they take partial views of the disease, and mistake a single circumstance or phenomenon in the morbid process for the initial or generative cause. Thus, Jeans and Sutton are correct in asserting that the alimentary canal is weakened and its function deranged; Latham is probably not wrong in representing the lymphatics to be obstructed; Wallis may be right in his idea of the nervous affection; and it cannot be doubted that the inflammation of the ligaments maintained by Kinglake is an important part of the regular form of the disease. In the same manner, there is some truth in each of the chemical opinions. The accurate researches of Wollaston show that one effect of gouty inflammation is the formation of chalk-stones consisting of uric acid and soda; Scudamore confirmed the results of Berthollet regarding the increase of the proportion of phosphoric acid during the gouty paroxysm; and various facts show that there is a predominance of acid in the alimentary canal, in the secretions of the skin, and in those of the kidneys.

Yet not one of these opinions is legitimate in regarding such circumstances as the proximate cause of the disease; for all of them are undoubtedly effects of some previous agent or condition of the system, which neither pathological observation nor chemical analysis can be said yet to have detected. The circumstances, on which these opinions are founded, are parts and important parts of the morbid process of gout; but to convert them into the process itself, or the generating agent of that process, is at once a partial and inconsistent mode of philosophy. To enter into an elaborate refutation of opinions so opposite is certainly unnecessary; for they can scarcely be mentioned without suggesting serious objections to their validity. It is obvious that the alimentary function may be very much disordered in many persons without producing gout; the nervous system may be weakened, and the lymphatics obstructed without giving rise to gout; the ligaments and tendons may be in the most com-

plete state of acute inflammation without betraying any character similar to gout; and there are instances of acidity of the stomach, of the blood, and of the secretions in persons who never suffered from gout. Scudamore found phosphoric acid in the urine not only in cases of gout, but in cases of inflammation of the skin, of acute rheumatism, of catarrh, of hepatic inflammation, of mesenteric tabes, and of *mollities ossium*, even in persons enjoying good health (129, 134); and the uric acid is found in the urine when there is no complaint, and when the digestion is slightly disordered.

Amidst these difficulties is it to be inferred that we are entirely ignorant of the proximate cause or pathological nature of gout? The inquiry, though considered by Scudamore, one of the most recent and the most elaborate writers on the subject, has not been determined; and evading the precise point of proximate cause, he has, after examining the theory of the symptoms at some length, come to the conclusion, that "gout is a disease depending upon a redundancy of blood with relation to the powers of the circulation, particularly affecting the system of the *vena portarum*, and the consequent functions of the liver; together with the production of a morbid change in the secreted products of the alimentary canal in general, and of the kidneys in particular." (P. 151.) This explanation is not satisfactory, inasmuch as it is neither distinct in its enunciation, nor peculiar in its application to the disease in question; and the general conclusion to which these observations lead is, that, in the present state of knowledge, the absolute determination of the proximate cause of gout is beyond the reach of the human faculties.

But though we are compelled to admit this conclusion regarding the intimate pathology and nature of the disease, enough is known to enable us to lay down tolerably distinct and precise principles of treatment. The natural history of gout shows that it consists of two parts: 1st, a general disposition pervading the whole system, and readily known by its usual effects, periodical or irregular, which may be distinguished as the constitutional mode or form of gout; 2d, certain local effects appearing periodically and regularly in the joints of the extremities, or irregularly in the symptoms above noticed in certain internal organs. According to this view of the disease the treatment naturally resolves itself into two parts;—1st, The examination of those therapeutic measures which operate on the

disposition or constitutional tendency; *2d*, The examination of those which operate on the paroxysms which constitute a fit of gout. The former is generally termed the prophylaxis or prevention; to the latter is restricted the name of cure.

THERAPEUTICS.—The treatment of gout may be consequently considered under the two divisions of prophylactic and curative. By prophylactic, or preventive treatment is understood, the consideration of those measures, the employment of which is either adequate to prevent the formation of gout, or prevent the accession of the distemper in any of its forms; in short, the extinction of the predisposition. By curative treatment is understood the consideration of the use of those means which are adequate to assuage the violence, and abridge the duration of the paroxysm, and to prevent the distemper from proceeding to the formation of morbid products.

A. The prophylactic treatment may be considered under two points of view; *First*, as a means of preventing the formation of the arthritic diathesis and developement of the distemper in any of its forms; and *secondly*, after one or more paroxysms have taken place, as the means of preventing their recurrence and effecting the extinction of the arthritic disposition.

The consideration of the means of preventing the developement of the arthritic diathesis involves the question, whether it be practicable to prevent the formation of this diathesis? Upon this point it may be observed, that all physicians are agreed that, by perseverance in avoiding the remote causes of the distemper, as already specified, it is possible to prevent the disposition from being developed. This is to be accomplished, however, not by the use of medicines or medical treatment, the effect of which, however judicious and energetic, is necessarily always temporary and partial, but by diet, and a well-devised system of exercise and general regimen.

No doubt can be entertained that it is possible by proper dietetic measures to prevent the gouty disposition from being engendered; for this may be regarded as established by the fact, that the disease does not take place in those who are accustomed to hard labour, and are prevented from indulging in the means of luxurious living. A point of great importance in a hygienic view, is to determine, whether in cases, in which the disposition may be believed to be present, from the circumstance of one or other of the parents or ancestors having laboured under the

disorder, it is possible to extinguish that disposition, or prevent it from breaking forth in paroxysms of external gout. The affirmative of this has been maintained by a considerable number of physicians, among others by Dolaëus, Cullen, Cadogan, Gregory. The last especially, the late Dr Gregory of Edinburgh, maintained that it was quite possible, by the patient subjecting himself in early life to great exercise, taken in a steady and persevering manner, conjoined with moderation and temperance in food and drink, to extinguish the predisposition so far, that it should give no indications of its existence. In proof of this he was in the habit of adducing as an example the history of his own case. Sprung of a family decidedly gouty, and his father having had several paroxysms of the disorder, he inferred that the disposition in every probability existed in his frame, and if not prevented and stifled by seasonable and energetic measures, would break out at the usual period of life. This took place at an early period. Between the age of twenty-three and thirty he had several attacks of external gout, and occasional gouty spasms in the stomach. He accordingly began at a very early period of life to take a great deal of exercise in walking, as much, indeed, as he could endure, and continued this regularly for a very long time. As to diet he did not think it necessary to adhere to the very low diet, or even the milk diet recommended by physicians for the eradication of the disorder, but took animal food, though in moderation, and avoided all excesses. The strict use of milk and grain diet he thought unnecessary, unless occasionally, as he was taking exercise to such an extent as to counteract any injurious effects of plethora likely to be thereby induced. By persevering in this system of management for upwards of twenty years between twenty-three and forty-five years of age, and after the latter period, to as great an extent as his professional duties allowed, he never afterwards, during the whole course of his life, had any symptom of external gout in the limbs, or even felt any symptoms of any of the anomalous forms of the disorder, further than occasional dyspeptic symptoms, which always yielded to proper treatment.

It must therefore be laid down as an indispensable rule, either with a view to the prevention of the formation of the arthritic diathesis, or to its extinction, if already in existence, that corporeal exercise should be taken to as great extent as the patient can bear, not in a desultory manner, or occasionally, but regularly, systematically, and habitually.

Next to regular exercise, moderation in the use of food and drink is quite indispensable. The patient should err neither by excess, nor in the quality of the articles employed as food and drink. Animal food, if eaten, should be taken not more than once daily; and it would be safest to permit it not more than three times a-week, unless the stomach is incapable of bearing vegetable food so long. When employed as food by those of gouty diathesis, it should be used as sparingly as possible, and dressed in the simplest manner, without any of those accompaniments which excite the appetite, and induce the patient to eat either freely or to excess.

The great difficulty in the way of enforcing a moderate and rather spare diet in the case of patients of arthritic diathesis, is the apprehension of inducing debility, either of the stomach, or of the system at large, and thereby, it is supposed, either of favouring the appearance of the disease in its irregular forms, or of rendering the system susceptible of other morbid states. It is never remembered, however, in this apprehension, how small a quantity of food is sufficient to sustain life, and even to nourish and maintain strength; and that feebleness and languor are more certainly induced, and carried to a greater degree, by the constant practice of taxing the stomach and bowels to the utmost extent of their physical and physiological powers, than when food and drink are taken in more moderation.

It would be easy to prove by example the fact, that the body may be well nourished, and maintained in good ordinary strength, when supported only on vegetable food, and not in great quantity. Thus Paul the hermit, who attained the advanced age of 115 years, of which he spent nearly one hundred in the desert, lived for the first forty years on dates and water only, and the rest of the time on bread and water. St Antony, who attained the age of 105 years, lived for eighty years in the wilderness on bread and water, with the addition at last of a little sallad. St Hilarion consumed daily only fifteen figs, or six ounces of barley bread, or fresh roots, and retained his health, with corporeal and mental vigour, to a very advanced age. Lewis Cornaro, the Venetian noble, after suffering great general disorder, constant fever, perpetual thirst, pains in the stomach, and various stitches and dartings of the gout, began at the age of 40 years a system of moderate diet, in which he took twelve ounces of solid food and fourteen ounces of liquid during the day, and adhered to it steadily during the whole subsequent pe-

riod of his life, which extended with good and even vigorous health to beyond 100 years.*

One of the best examples of the excellent effects of moderation in eating and drinking, and especially the substitution of pure water for malt liquor, is found in the history of the case of Mr Thomas Wood of Billericay, in Essex, as recorded by Sir George Baker in the Transactions of the Royal College of Physicians, (Vol. ii. p. 259, and Vol. iii. p. 309.) This person, from living freely on large quantities of fat meat, with butter and cheese, and a suitable proportion of ale, became exceedingly corpulent, and began, in his fortieth year, to suffer severely from heartburn, sickness, constant thirst, pains in the bowels, headach, giddiness, a sense of urgent suffocation coming on, especially after meals; violent rheumatism, and frequent attacks of gout; and he had also two epileptic fits. These symptoms continued increasing in severity till August 1764, a space of nearly five years; when, in consequence of reading the work of Cornaro, he determined to diminish the quantity, and change the quality of his food, as he was satisfied that all his sufferings proceeded from intemperance. At first he diminished the quantity of animal food and ale very much; and as he found that this continued for two months relieved most of his ailments, but did not altogether remove them, as he was still tormented both by rheumatism and gout, he abandoned the use of cheese and animal food entirely, about three years after beginning his reduced regimen, and confined himself to pudding made of one pound of coarse flour, sufficiently boiled, with a pint and a half of skimmed milk. Of this he took one pound and a half for breakfast, at between four and five in the morning, and the same at noon as dinner; and abstained from all other food in the twenty-four hours. Under this regimen Mr Wood not only got rid of the rheumatic pains and gout, but became strong, vigorous, and agile, and enjoyed good health till his sixty-fourth year, when he died from inflammation of the bowels, induced by exposure to cold.

Dr William Stark mentions that Mr Slingsby lived many years on bread, milk, and vegetables, without animal food or wine; and that since he observed this regimen, he was very vigorous, enjoyed good spirits, and remained free from gout; and that Dr Knight lived long on diet strictly vegetable, excepting eggs, milk with tea or chocolate, and butter, taking, however, a

* A Treatise on a Sober Life. By Lewis Cornaro. London, 1779.

little wine; and that, living in this manner, he had been free from attacks of gout.

Dr Stark himself ascertained experimentally, that, by living on bread and water, varying from twenty to twenty-eight ounces of the former, he enjoyed good health and spirits, though flatulent symptoms occasionally took place. (Works, p. 98, London, 1788, 4to.)

One of the most pertinent examples that can be adduced, both in illustration of the health and strength that may be preserved, and the degree of mental vigour and energy, as well as endurance of corporeal labour that may be maintained by diet of mere bread and water, is afforded by the life of Benjamin Franklin. This celebrated man informs us, that, when working as a journeyman-printer in London, in 1725, in the nineteenth year of his age, he lived a fortnight on bread and water, consuming about ten pounds of bread in the week, or one pound and a-half daily, and during the whole time of his residence, though he sometimes increased his allowance, he took no malt liquor; yet he enjoyed a greater degree of average vigour, strength, and endurance of labour than any of his fellow-workmen, who consumed as much animal food as they could get, with proportionable quantities of malt liquor. He states that he was the strongest among fifty workmen, all of whom drank beer, and one to the extent of six pints daily. (Life written by himself, p. 119, 120.)

Lastly, we know from such instances of shipwreck, or destitution and privation, as that recorded by Lieutenant Bligh of himself and his boat's crew in the South Sea, and that recorded by Captain Franklin, that life may be preserved, and health maintained, and even a considerable degree of strength continued, on very scanty means of subsistence; and from the accounts given by Sir Francis Head of the immense loads carried by the South American miners, though fed entirely on grain and pulse, it must be inferred, that vegetable food is quite adequate to maintain health and strength.

From these and similar facts, I think we are fully entitled to draw the following conclusions in regard to the prophylactic management of the arthritic diathesis and gouty patients.

1. Diet consisting of animal food is not requisite either to preserve health or maintain strength; and diet of articles from which the flesh of animals is altogether excluded is perfectly adequate to the sustenance of the human body in a state of good health and strength.

2. Diet consisting of farinaceous matters with milk, with the occasional use of fresh vegetables, may be used with perfect safety by gouty and dyspeptic invalids, and without the risk of inducing those symptoms of atony which have been generally ascribed to them. When symptoms of atony or wandering gout in the stomach and nervous system seem to ensue on the use of such diet, there is good reason to believe that more of it is taken at one time than the stomach is able to transform readily into good chyme; and that, consequently, irritation is induced first in the stomach, *duodenum*, and *ileum*, by the presence of imperfectly digested aliment, and secondly, in the vascular system, by the presence of imperfectly prepared chyle. The feebleness and languor occasioned by this constant irritation and struggle of the vital tissues, is much greater than that induced by a lower rate of diet, the use of which would not be followed by symptoms of indigestion, and gastric or intestinal or vascular irritation.

3. Diet consisting of bread and milk, or rice and milk, or the flour of the farinaceous seeds and milk, is quite adequate to prevent the formation of the gouty diathesis, and to extinguish that diathesis if already formed. Diet, from which the flesh of animals is altogether excluded, is quite adequate to extinguish the gouty diathesis, and to prevent the recurrence of gouty paroxysms after they have once taken place. Such diet is also adequate to prevent the disease from appearing in its irregular form, and affecting the brain or its membranes, and the heart or lungs. (Mr Wood's Case.)

4. The use of wine, malt liquors, or spirits, is not necessary either to maintain health or strength, or to support what has been named the tone of the stomach in gouty persons. When such unnatural stimuli are thought requisite, it is because a larger quantity of food has been taken than the powers of the stomach are adequate to convert into proper chyme. The employment of these and similar stimuli, which are administered under these circumstances, does not increase the powers of the stomach, but merely, by diminishing the sensibility of its mucous surface, sometimes, by coagulating the alimentary mass, and suspending or retarding the digestive process, prevents the feelings from being so readily felt by the patient.

5. Pure water, toast water, or soda water, is the safest beverage for gouty persons.

If further arguments were required in proof of the position,

that milk and grain diet, not in large quantity, or diet of boiled vegetables and milk, while both necessary and adequate to the cure of gout, is perfectly safe, and much less injurious than diet of animal food, they may be found in the facts observed in the physiological relation between the stomach on the one hand, and the skin and the lungs on the other.

Whenever the stomach is compelled, by the intemperate habits of mankind, to attempt more laborious duties than those to which it is naturally adequate or fitted, whenever either a larger quantity of aliment, or aliment less easily chymified than is suited to its powers is introduced, then the over-excited organ borrows, if I may so express it, the aid of the skin and the lungs. A state of irritation is induced in the vessels of the stomach, *duodenum*, and *ileum*; the circulation of the skin is disordered and subverted. It becomes cold and dry during the early stage of the process of digestion, hot but dry towards its middle stage, and after the process is completed, it is moistened with perspiration, which is always excessive in quantity and changed in quality, being unusually acid. This irritation excited in the gastro-intestinal organs also produces analogous disorder in the pulmonary circulation. It was ascertained by the experiments of Dr Fyfe, and the observation of Mr Spalding in his own person, that in the same individual, while animal food is taken, a larger quantity of air is required for respiration, and a greater proportion of oxygen is consumed than when vegetable aliment is employed. It may be further inferred, that the greater the quantity of animal food consumed, the greater is the quantity of oxygen consumed by the lungs in respiration in a given time. The respirations also are more frequent in a given time when the individual subsists on animal food, than when he lives on vegetable aliment. These facts show that the sustenance of the frame by means of animal diet causes a more violent and laborious action of the lungs than the sustenance of the same frame by means of vegetable diet. Hence persons living much on animal food breathe laboriously, and are less capable of fatigue or any muscular exertion, which constrains the motions of the chest and respiration, than those who live mostly or altogether on vegetable food. It is chiefly during the close of the digestive process that this labour of the lungs and their circulation is observed, when probably the animal chyle is entering the circulating current, and begins to evince its presence by the increased and more numerous efforts of the pulmonary organs.

With regard to wine and all fermented liquors, there can be no doubt that, whether with the view to prevent the formation of the diathesis, or to extinguish it when formed, their use ought to be either very sparingly permitted, or rather to be entirely and unconditionally abandoned; and, *a fortiori*, when the disease has betrayed its existence by two or more distinct paroxysms, such liquors should never be tasted or allowed. The example of Sydenham, who was in the habit of permitting Spanish wine in preference to French or Rhenish wine for gouty persons who would not dispense with this liquor, and also of taking himself in the translated gout a draught of Canary, has led many authorities to adopt his example, invariably to their own injury. Hence many patients have taken, and not a few physicians have sanctioned the use of the stronger Spanish or Portugal wines, as liquors safe and not detrimental to the gouty stomach. Others, admitting that all wines, even the stronger, are hurtful, have recommended, as less acescent, brandy and water, which has accordingly become a frequent drink with gouty patients and those in whom the digestive process is liable to be accompanied with the presence of acidity. These fancies are the most pernicious illusions. No kind of wine can be taken much or habitually by those of gouty diathesis without increasing that diathesis, if it exist; nor can it be long taken without creating the diathesis if it do not exist. The use of spirits and water is not less pernicious; and though taken at first only as symptoms require, it is so liable to become necessary by repetition, and to become habitual, that the only safe course is never to permit its use in any degree or shape to persons of gouty diathesis.

The salutary influence of regular exercise and moderate diet will be greatly aided by the effects of friction, shampooing, and the use of the warm bath.

The warm or the tepid bath is of great importance as a means of maintaining in a healthy and energetic state the cutaneous circulation, and the outer surface of the skin. The hot bath has been supposed to be too stimulating, and to be in danger of increasing the congestion in the head and other internal parts. But this objection is less applicable to the warm and the tepid bath, which excite in a slight degree, and may be used in such a manner as to cleanse the skin from all impurities and bad excretions. If attainable the tepid sea-water bath furnishes the most efficacious form in which the remedy can be applied. Even

when the entire person cannot be conveniently immersed in the tepid bath, it is always beneficial to immerse the lower extremities, and rub the surface carefully, so as to deterge and cleanse it completely.

After thorough ablution, it is desirable to rub the surface completely dry with dry towels, not very smooth, and to continue this friction for a considerable time, until the surface of the skin become reddish, and feel a little warm.

The great use of the warm or tepid washing and rubbing is, to promote the energy of the cutaneous circulation, and to maintain the insensible transpiration in a uniform state.

The influence of friction and shampooing, both as a preventive and a curative agent, is well established, and generally admitted. Its effects have been illustrated and enforced by many authors, among others, by Mercurialis and Fuller; and its effects as a prophylactic and curative means in gout have been very fully demonstrated by Admiral Henry of Rolvenden in his own person. Parts rendered stiff, swelled, or inflexible by gout, he was in the habit of beating or pummelling with a small iron hammer, covered with leather, or kneading by means of instruments of bone, or glass phials, corked, and smoothed by filing; and by this method of treatment, which may be regarded as percussion, or a perfect and violent kind of shampooing, it is said that he removed altogether various rheumatic and gouty swellings and pains, and rendered pliant and flexible parts which had been previously rigid.*

The methods employed by Admiral Henry seem to have been too harsh and violent to admit of general application. But the same object may be accomplished by milder and more agreeable methods. Admiral Henry also seems to have operated on himself. For the majority of gouty persons the friction and percussion would require to be performed by attendants. It has been said that no man need suffer from gout who can have a person to rub and curry him, as a groom does a horse; and this perhaps is the most effectual method of applying the remedy, while it is most generally fitted to the majority of patients.

As to the form of exercise, the best and most efficient for preventing the formation of the gouty diathesis is, doubtless, walking, and the habitual use of those exercises which excite

* An Account of the Means by which Admiral Henry of Rolvenden, in Kent, has cured the Rheumatism, a tendency to Gout, the Tic-Douloureux, the Cramp, and other Disorders, &c. London, 1816. 8vo. Pp. 20.

the action of the muscles of the upper extremities also; and wherever the patient is still vigorous and not advanced in life, he should persevere in walking as much as his strength and time will permit; and using occasionally dumb-bells, or practising single-stick or small sword exercise. It often happens, however, that gouty persons are unable or unwilling to walk much; and physicians have hence been anxious to suggest the use of those forms of exercise which might, without fatiguing, be not less beneficial. Riding on horseback was strongly commended by Sydenham, as the best exercise for arthritic persons, provided it be not contraindicated by age or by the presence of stone. The effect of this, if continued for two, or three, or four hours daily, is not only to give a general, though gentle, excitement to all the muscles, but to promote the circulation through the lungs, and also that of the abdominal organs; and, in general, both digestion is improved by it, and the secretions and excretions are augmented.

Where horse-exercise is inadmissible, gestation in a carriage is recommended; and the authority of Sydenham has been adduced to prove that, if frequently performed, it answers almost as well. That this, however, is a mistake is shown by the daily observation of physicians, who know that carriage exercise is of little avail as a means of preserving health, or restoring it if impaired. All that can be said is, that it is better than no exercise, and it affords an imperfect method of breathing fresh air. But, as a means of exercise, it cannot be compared either with walking or riding on horseback. It suits well, however, for those who have no longer the use of their feet.

The great object of all these measures is to obviate plethora, and, above all, congestion in the abdominal organs, and to maintain the regular and proper state of the different secretions and excretions; and hence in selecting different sorts either of diet or exercise, unless the cutaneous and urinary secretion be maintained in a state of health, and the intestinal excretions be duly and periodically evacuated, neither diet nor exercise can be expected to be beneficial or curative.

I have already adverted to the fact that, in gouty and in arthritic persons, there is induced previously to the formation of the disease a state of congestion or plethora in the vessels of the alimentary canal and the abdominal organs in general; and as this slow or impeded state of the circulation, with the loaded state of the vessels, is of long duration, it requires the long con-

tinued use of remedies calculated to diminish and remove it, and thereby remove its effects. This state of the abdominal organs, though partially known for a long time, was first fully explained and enforced by John Kaempf, Physician at the court of Hesse-Hambourg, about the middle of the eighteenth century, who ascribed to its influence, under the name of *Infarctus*, the presence of gout and several other chronic disorders, believed to be allied to gout; and proposed to remove it by means of the frequent use of injections. It is probable that Kaempf and his sons and pupils, by whom chiefly his doctrines were propagated, carried to an injurious extent the employment of *enemata*, which other physicians believed to excite or aggravate the irritation, which Kaempf represented he wished to remove. But no doubt can be entertained about the excellence of the object which he had in view, and the indication which he wished to fulfil. The bowels are very slow and torpid in all arthritic persons; and when they are emptied, large quantities of dark-coloured tarry, or oily excrements are generally expelled. One of the great objects of every person presenting any of the marks or symptoms of the arthritic diathesis, is to obviate and prevent this condition of abdominal plethora and congestion, (*Infarctus*,) either by suitable diet and exercise, or by the use of laxative or even purgative medicine; and hence, in all dietetic rules, and in the observance of exercise, the patient should be instructed so as to manage rightly the intestinal secretions, and in this manner to prevent the formation of that state which is favourable to the production of the distemper.

For accomplishing the indication now mentioned, several means may be adopted. The most common and most easily managed is the frequent use of aloetic or compound colocynth pills, according to their effects. It sometimes happens, however, that the use of these substances seems to be followed not only with an immediate voracious increase of appetite, but afterwards with an increased degree of constipation and consequent intestinal congestion. To counteract this inconvenience, it is desirable to employ pills, consisting of four grains of the aloetic or compound colocynth pill mass, and a single grain of powder of ipecacuan or tartrate of antimony. The latter, exhibited in this manner, act not only as laxatives, but as means of abating the morbid keenness of appetite remarkable in many gouty patients.

Regarding the time during which the dietetic restrictions and

regiminal rules already specified ought to be observed, the question has been proposed by physicians, whether it be necessary to adhere to them for a definite time or the greater part of life. When Dolaeus impressed the efficacy of milk diet in the extinction of the gouty diathesis, and the total removal of the distemper, he established the general principle, that the longer the diet was continued, the more perfect would be the cure. But, while some, he allowed, adhered to it constantly, others observed the use of milk diet only for one year, for fourteen months, or one year and a-half. (*Tractatus de Furia Podagrae*, §. v.) This rule has been also believed to be applicable to restrained diet in general. It cannot be doubted that living in this manner for a certain time will make a decided impression on the morbid diathesis, and also on its symptomatic effects. But the patient must not flatter himself with the belief that such a course will entirely eradicate the distemper. To do this effectually, it will be requisite to adhere to restrained diet for the whole subsequent period of life. No gouty individual can, with impunity, return to the use of animal food, either freely or habitually; and if he do, he will assuredly find that such a return will be followed either by pains and fits of regular external gout, or one or other of the forms of anomalous gout in one of the internal organs. He should bear in remembrance that, as life advances, the powers of the alimentary canal are less energetic; and that after the body has attained its full size, all alimentary matter not absolutely requisite to supply waste will assuredly oppress and overload the various organs.

The means now specified, if early adopted and steadily adhered to, will prove not only the most effectual but the safest in eradicating the gouty diathesis, or at least in reducing it to that state of quiescence that the patient may enjoy not only health but comfort. It is unfortunate, however, that mankind, partly from mistaken notions on the kind and amount of food and drink requisite to nourish and maintain the human body in health and strength, partly from incapacity to resist the gratification of their appetites and the indulgence of their tastes, have been very rarely capable of persevering, with the requisite firmness, in a suitable course of diet and exercise; and many gouty persons in particular have continued in the indulgence of those habits by which the morbid disposition was originally engendered and brought into action. Persons of this turn of mind have

been ever anxious to find in medicine what medicine never can furnish, and have therefore gladly turned aside from those unpalatable restraints, which regulated diet and regimen impose for the cure of chronic disease. It is in consequence of this disposition among mankind, that physicians have at various periods of the art proposed the employment of various curative methods, calculated, as they believed, to eradicate the gouty diathesis, and cure the disease permanently, without the use of those severe restrictions which have been already shown to be requisite. As in the case of all diseases little subject to the influence of medicine, these means have been numerous; and have been with more or less avidity and confidence adopted by patients. In no case, however, have they answered the expectations entertained, and in all instances they have proved hurtful, not so much by any pernicious qualities in themselves, as by withdrawing the attention and the confidence of the patient from the constant use of the only means by which he could be permanently delivered from his disorder.

It is unnecessary here to consider all the methods proposed for securing against attacks of gout; but I must advert to a few which have been employed at different times with much confidence.

The first remedy of this description is what has been named the Duke of Portland's Gout Powder, or simply the Portland Powder, (*Pulvis Portlandicus*, Heberden.) This consists of equal parts of the root of birthwort (*Aristolochia rotunda*,) and gentian (*Gentiana lutea*,) and of the tops and leaves of Germander (*Teucrium Chamaedrys*,) ground-pine (*Teucrium Chamaepitys*, Linn. *Ajuga Chamaepitys*, Decand.) and less Centaury (*Chironia Centaurium*; *Erythræa*,) well dried, reduced to powder, and sifted. Of this mixture one drachm was to be taken fasting every morning in a cup of wine and water, tea, or any other vehicle; and this dose to be continued for three months without interruption. After this period the dose was to be diminished to three-fourths of a drachm for three months; and then to half a drachm for six months longer. After this period it was to be continued in doses of half a drachm only for a whole year; and as it operates, it is said insensibly, it is only at the close of two years that its alleged antarthritic powers begin to be felt.

Whatever fashion and credit this powder obtained as a remedy against gout, the history of its introduction, and the previous his-

tory of medicine, show that it is not a new remedy, but one which has been used from the earliest periods of medicine in different forms. Dr Clephane has shown very clearly, that powders consisting of various bitter herbs, but in general agreeing in containing most of the ingredients of the Portland powder, were recommended and used as antidotes to gout, previous to, and during the time of, Galen, Cœlius Aurelianus, Aetius, Alexander of Tralles, and Paul of Aegina, and were adopted from the works of these writers by the physicians of the Arabian school and others, after the revival of literature, when the formulæ for their composition were transcribed by several of the early medical writers, and thus brought into use in Italy, Germany, and Switzerland. It was from the last of these countries that a friend of the then Duke of Portland brought the receipt for the powder so named, exactly copied from a domestic collection of approved receipts which had belonged to his father. (Medical Observations and Inquiries, Vol. i. xiv. p. 126.)

It appears from the testimony of Cœlius Aurelianus and Alexander of Tralles, that a long continued use of these bitter medicines by the gouty was believed to be attended with hurtful and sometimes fatal effects; the former in particular positively stating that some became apoplectic, others pleuritic, others peripneumonic, and some were afflicted with constant difficult breathing.*

The testimony of all observant and experienced physicians in modern times tends to condemn the use of this remedy in gout as injurious, though on different grounds.

It is allowed that the use of these and similar bitter medicines is really followed by the effect of preventing the return of fits of regular gout; but it also appears that, in individuals so treated, some of the anomalous forms of the distemper were liable to ensue, and destroy the patient speedily. The birthwort (*Aristolochia rotunda*), which makes a considerable part of the Portland powder, has been long in use in Germany as a remedy against gout; and to this in particular, and bitters in general, Werlhoff ascribes not only subsequent loss of appetite and indigestion, but speedy death.†

* Cœlius Aurelianus, Morbor. Chron. Lib. v. cap. 2.

† Sed ex nimio horum amaricantium usu, fermentum stomachi adeo debilitatum esse memini, ut nonnulli appetitum amiserint, cibos non concoxerint, mortem hinc potius, quam sanitatem accelerarint; malique et infausti remedii sævas dederint penas.—Werlhoff, Caut. Medicæ, p. 34.

Cullen himself, while he admits that the use of the Portland powder for the prescribed period was followed by the disappearance or rather the non-recurrence of the inflammatory external gout, in persons in whom it had been pretty regular, yet adds that the same persons, though free from any regular fit of the disorder for the rest of their life, enjoyed by no means entire or good health. Soon after finishing their course of medicine they presented various symptoms of valetudinary and impaired health, especially dyspeptic symptoms, and nervous complaints, with low spirits. In every one of them, before a year had elapsed, after finishing the course of the powders, dropsical symptoms appeared, and gradually increased in the form of *hydrothorax* or *ascites*, and, conjoined with anasarca, in less than two or at most three years proved fatal. In such cases it is impossible to doubt that the dropsical symptoms were the effect of disease of the heart. In other instances, such patients were suddenly destroyed by apoplexy.

Not dissimilar, though modified by his pathological notions, is the testimony of Dr Cadogan on the effects of this medicine. "Its effect," says he, "was to keep up constant fever as long as it was taken. This kept the gouty matter always afloat, and prevented it fixing anywhere. But there was no living long with a constant fever; accordingly many of those who took it, died very soon. I myself observed between fifty and sixty of its advocates, some my patients, some my acquaintance or neighbours, who were apparently cured by it for a little while; but in less than six years time, *omnes ad internecionem cæsi*, they all died to a man." *

Still more pointed and forcible if possible, is the testimony of John Andrew Murray of Upsal, who states that many persons, in consequence of taking the Portland powder (*Pulvis arthriticus*,) especially aged persons, fall into apoplexy, or palsy, or acute and dangerous disorders. In one person, indeed, in whom the gouty symptoms were assuaged, difficult breathing and dry cough came on, and were suddenly followed by death; and on inspection, the lungs were found filled with tubercles. †

* A Dissertation on the Gout, &c. London, 1771. pp. 79.

† Ex pulvere arthritico multi apoplexiam, paralyisin, vel morbis acutos, senes præcipue, contraxerunt. Et in homine quodam, arthritis quidem inde sedata, sed respiratio difficilis, tussis sicca, morsque subitanea successit, tuberculis pulmonum post mortem conspicuis. Murray, Apparatus Medicaminum. Gottingæ, 1776, Vol. i. page 355.

These opinions on the effects of bitter medicines in general, and on those of the Portland powder in particular, are within certain limits well founded; but they are liable in the present instance to a considerable source of fallacy. The truth is, that the very effects which have been ascribed to the powder, may result from gout itself, which, as has been already shown, has a tendency naturally to terminate in apoplexy and palsy particularly, and occasionally in dropsy of the chest with incurable asthma, in other words, in disease of the heart. "I have several times known them," says Dr Heberden, "succeed to long and severe fits of regular gout."* In the instances, therefore, in which the powder was given to gouty persons with apparently fatal effects, it is not easy to distinguish the natural consequences of the gouty disposition from the proper effects of the medicine; and this difficulty is increased by the circumstance of this powder augmenting the appetite to such an unnatural and pernicious degree, as to aggravate rather than diminish the plethoric and morbid state of the circulation.

Upon the whole, the observation of Heberden, that, under the use of this medicine, the fit was in so many instances rendered either milder or less frequent in recurrence, led him to entertain no doubt that it actually produced these effects; whereas it never appeared either certain or probable to him, that it caused the evils ascribed to it. The dose was too large, and in many persons was injurious by the loathing and sickness which followed. To obviate this inconvenience, Heberden was of opinion that bitters in small doses would be given to gouty persons with greater chance of benefit. As to the combination composing the Portland powder, it has sunk into merited neglect, and is not likely to be soon revived. It is probable that, whatever effects are wished to be obtained in this way, will be most easily and safely produced by moderate doses of Peruvian bark, or sulphate of quina, quassia, gentian, or calumba, or any of the bitter tonic medicines. But, in ordinary circumstances, the most judicious plan is to regulate the action of the stomach and bowels by such management of food, exercise, and laxative me-

* "Tum quia non morbo, sed remedio ejus imputata sunt omnia illa mala quæ propria sunt arthritidis, et præcipue paralyses et apoplexiæ; quæ quidem mihi non dubium est, quia ad arthritidem revera pertineant, quoniam in non paucis secutæ sunt longas et vehementes podagræ accessiones." Gulielmi Heberden, *Commentarii*, &c. p. 49. London, 1807.

dicine, as may at once maintain the process of digestion unimpaired, and not reduce the general strength.

Guaiacum. — Another remedy which for a time enjoyed some reputation as an antidote to gout is the tincture of guaiacum. This, which had been long in use as a remedy against rheumatic pains, was first introduced into notice as an antidote against gout in 1776, by M. Emerigon, Attorney-General at St Pierre in the island of Martinique. This gentleman, who had suffered much, almost to lameness, from gout, from the fifty-fifth year of his age, after trying for nine years the usual remedies without benefit, was led, from the testimony of a Caraib, to have recourse to a strong solution of gum guaiacum in rum, prepared by digesting two ounces of the gum-resin in powder in three pounds avoirdupois of the spirit for seven days, and then filtering through muslin or paper, and decanting and bottling for use. Of this tincture the patient takes a tablespoonful fasting every morning for twelve months or more. The effects of this medicine were said to be to determine to the skin, to act as a gentle purgative, to remove the symptoms of gastric disorder, to prevent the recurrence either of flying gouty pains, or the acute torture of the inflammatory gout, and to restore the pliancy and mobility of the joints. Rum is recommended as the proper spirit for this tincture; and when the gum-resin is dissolved in brandy it is said not to produce the same effects. *

This remedy has been tried in different countries of Europe with different degrees of success. Though many persons found it efficacious in relieving the gouty pains and other symptoms of the distemper; and, among others, Dr Dawson published cases conceived to illustrate its therapeutic properties in gout: yet many others were disappointed, and some have sustained detriment from its use. It has been represented by its patrons to be capable of administration even during the time of the gouty paroxysm; and Dr Dawson appears to have given it under these circumstances. The results of several instances of its exhibition induced Cullen to conclude that this was a hurtful practice. †

In short, whatever control this gum-resin may appear to

* Letters of M. Emerigon in Dawson's cases on the Acute Rheumatism and Gout, London 1781, 8vo. Appendix, p. 3.

† *Materia Medica*, Vol. ii. p. 198.

exercise over the paroxysms and pains of external gout, it is doubtful whether it possesses any influence over the gouty diathesis, and hence it does not prevent the anomalous forms of the distemper from being developed.

Alkaline Remedies.—It was early observed that, in gouty persons, both previous to the approach of the fit and during its presence, symptoms of acidity in the stomach and *duodenum* were predominant; and it was also observed that all acescent articles of food and drink have a tendency not only to foster the arthritic diathesis, but to induce, in certain circumstances, paroxysms of the disease. The connection between gout and gravel, or stone, also, which was observed by Sydenham and Musgrave, by Clerk and Whytt, and fully illustrated in 1767 by John Andrew Murray, and in 1786 and 1793 by Mr Murray Forbes, afforded additional proofs of the pernicious effects of acescent food and drink, and acidity of the alimentary canal. Partly from observing these phenomena, partly from experimental proofs, it became a practice to exhibit alkaline or earthy remedies in attempting the eradication of the gouty diathesis. Thus M. Liger and Dr Clerk proposed soap as an antarthritic; Whytt found lime-water extremely beneficial; and Mr Murray Forbes recommended strongly the use of alkalies and absorbent earths, with the view of neutralizing acidity and counteracting its effects.

The exhibition of these agents has been regulated by modern chemistry on more scientific principles than heretofore. From his analysis of the concretions formed during the gouty paroxysm, Dr Wollaston was inclined to place considerable reliance on the powers of the fixed alkalies, potass, and soda; and Parkinson ascribes great benefit to their administration, whether in the form of pure soda or of water of potass. They are most useful, according to Scudamore, when combined with aperients. Lime-water, with which Whytt cured a case of gout, is useful chiefly when it operates on the bowels. Pure magnesia has been much recommended by Sir Everard Home and Mr Brand; and it undoubtedly possesses considerable antacid powers; but it is liable to the same restriction as the alkalies,—and, as it is sometimes converted into concrete masses in the bowels, the necessity of combining it with purgatives is more obvious.—(Scudamore, p. 676, 679.) The best plan, perhaps, if magnesia be given alone, is to exhibit next morning half an ounce or six drachms of castor oil, or two of the compound colocynth pills at bed-time. In other instances it is desirable to administer every second or third

day an efficient injection. When it is given in combination with other laxatives, the most usual is rhubarb. From two scruples to a drachm of the compound rhubarb powder may be taken as the symptoms indicate, or five or six grains of rhubarb with an equal quantity of calcined magnesia, or the compound rhubarb pill may be taken daily about an hour or half an hour before dinner. The popular objection against the use of pills containing aloes as a cause of piles is frivolous; if costiveness is prevented, the vessels of the rectum are not likely to be overcharged, nor the circulation deranged. An antacid remedy still more convenient for gouty patients consists in carbonate of soda and rhubarb combined in the proportion of five grains of each, given twice or three times daily. But if by proper management of his food and well-timed exercise, the patient can insure the regular and periodical discharge of the bowels without the aid of medicine, his health will not only be preserved in a more uniform condition, but the possibility of an attack of gout will be almost annihilated.

B. The curative treatment of gout consists in the knowledge of the means to be employed during the time of the paroxysm, either with the view of mitigating the severity of the sufferings of the patient, abridging their duration, or preventing the morbid action from proceeding to produce various organic changes in the ligaments, tendons, periosteum, bones, and joints.

And, in the first place, it is to be observed, that, as most fits of gout are introduced by more or less gastric and gastro-enteric disorder, it should be a proper practice in every instance, where the presence of dyspeptic symptoms and slight pains of the feet indicate the approach of a paroxysm, to have recourse to such remedies as are calculated to remove the dyspeptic symptoms, and counteract their effects. The diet should be diminished in quantity, and all wine or fermented liquors ought to be abandoned. Eccoprotic laxatives or purgatives, according to the nature of the discharges brought away, and the alleviation of the symptoms produced, should be exhibited; and it may be desirable to counteract the effects of acidity, by giving five or ten grains of bicarbonate of soda, or twenty drops of the *aqua potassæ* three times daily.

When the paroxysm has actually commenced by stiffness and pain of the foot or hand, it becomes a question whether a more prompt and decided line of practice becomes requisite; and various opinions have been entertained as to the propriety of adopt-

ing antiphlogistic measures, or proceeding upon the expectant and temporizing or palliative system.

General Blood-letting.—From the acuteness of the pain, the intensity of the heat, and the termination in swelling, with the restlessness and feverish symptoms, it might be supposed that general or local blood-letting is indicated in order to subdue inflammatory action. Many physicians, nevertheless, have been led to the conclusion, that blood-letting during the paroxysm, however strongly indicated, is not altogether either so beneficial in controlling the symptoms or removing the disease, as might be expected. Sydenham was averse to its use, and forbade it, except in the case of young vigorous persons who had been overheated by hard drinking or excess, when he allowed that a vein might be opened; but even then he maintained that, however beneficial it may appear in the meantime to be, if blood-letting be always used in the paroxysms, it renders the gout inveterate even in youth, and causes it to spread more universally in a few years, than it would otherwise have done in many.

The authority of Sydenham has exerted great influence upon all subsequent physicians. Boerhaave admitted that, though it reached not the seat and cause of the evil, it was sometimes accidentally beneficial. Boulton inferred, that, though blood-letting is prejudicial in gout, by favouring the retention and increase of the antecedent cause of the distemper, because, by weakening the body and emptying the vessels, it hinders the expulsion of the morbid humour; yet he allowed that it might be practised, and that it is sometimes necessary not only to relieve bad symptoms attending the distemper, but other distempers complicated with it, (p. 70.) Cheyne, though admitting the inflammatory nature of the distemper, had not courage, however, to draw blood, and rested satisfied with diluents, diaphoretics, antacids, and laxatives; and, believing that during the paroxysm all active treatment was inert or hurtful, he inculcated the principle, that it was in the intervals of the fits that anything great is to be undertaken for the relief or cure of the gouty. (xviii. xxi.) Dr Thomas Thompson, who maintained strenuously the inflammatory nature of the distemper, and denied altogether the existence of gouty matter, taught that gout should be treated as inflammatory disorders, by blood-letting, cathartics, and evacuates in general, with the use of low diet and diluents. He cautioned, however, against carrying these measures to too great an extent.

Cullen adopted very much the views of Sydenham, and, though he allowed that blood-letting might be indicated, might be required, and might be safely practised in the first paroxysms, and in the young and vigorous; yet he expressed his persuasion, that it could not be often repeated with safety; both because it enfeebled the tone of the system and tended to produce plethora. It is known that blood-letting tends to produce irregular determination and local congestion; but whether it produces plethora, properly so named, is doubtful.

The employment of blood-letting found strenuous and able advocates in Rush of Philadelphia and Hamilton of Lynn Regis, who speak of blood-letting as a remedy not only powerful but free from danger; and, more recently, we have the conclusive testimony of the late Dr Parry of Bath in its favour. The latter author, though not in all cases ascribing the distemper to inflammatory action, but after tracing it to irregular determination, (*Elements of Pathology and Therapeutics*, (DCCCCXV—DCCCCXXXII.) both indicated the necessity of blood-letting as a preliminary means of equalizing the circulation, and showed experimentally its beneficial effects. (*Posthumous Works*, Vol. i. p. 252, 258.) But by far the most intelligent advocate for the employment of blood-letting in the treatment of the gouty paroxysm, and the physician who has most clearly explained the principles, on which it is rendered necessary, is Dr Barlow of Bath. This pathologist, referring to the states of the system under and after which gout is developed, maintains the existence of three kinds of *plethora*, plenitude or repletion; one,—in which the nutritious function is redundant without much affecting the self-adjusting powers of the system, or without much diminution of the excreting function; the second, with some disorder of the excreting function,—taking place chiefly in constitutions deficient in natural vigour or impaired by predisposition to disease; and the third, with impaired action of the excreting function, indicated by sallow dingy complexion, harsh, dry skin, slow, inert and constipated bowels, and high-coloured fetid urine. As acute or regular gout occurs in connection with one or other of the two first forms of *plethora*, and as these cannot be satisfactorily or effectually removed without the employment of blood-letting, Dr Barlow recommends that evacuation, both generally and locally, especially in persons young, or even not aged, and of average vigour of constitution.

Most of the French authors, on the other hand, as Barthéz,

Guilbert, and Hallé, reprobate its use as a pernicious practice, (§. 41,) but allow that it may be done with greater safety from the foot.

Lastly, Dr Scudamore regards general blood-letting as wholly unnecessary for the removal of inflammatory action; and he thinks that it does not afford that relief to the local inflammation and the pain which might be expected. He allows, however, that when the inflammatory diathesis is strongly marked, or when the symptoms indicate the affection of any internal organ with inflammation, general blood-letting is indicated as if no gout were present.

The only arguments against the employment of blood-letting in gout, are derived from the circumstance of debility occasionally being induced, and the constitution thus being imagined to be too feeble to cause the usual inflammatory attacks of the extremities. These may be arguments against the indiscriminate and excessive use of blood-letting; but not against its moderate and proper use. I have myself seen no bad effects from its moderate employment.

Upon the whole, I conclude, from what I have seen of the employment of blood-letting in gout, that in persons young or not very aged, and with constitutions not much impaired, it is almost impossible to expect a severe fit of gout to be speedily controlled without the use of blood-letting, which may be carried, in the first instance, to the extent of 18 or 20 ounces, and even repeated to 18 or 20 more, if the pain, heat, and uneasiness be not decidedly abated.

One of the great objections against blood-letting appears also to be applicable to that when trusted to alone. Its influence ought to be immediately aided by means of local bleeding, antimonials, and laxatives, and such remedies as are calculated to diminish the intensity of the disorder in the alimentary canal, and assuage the severity of the local disorder.

Local Bleeding.—If, in short, there be doubt about general blood-letting, there can be none regarding local bleeding by means of leeches, 18 or 20 of which should be at once applied to the hot and painful parts of the foot or hand.

But even the application of leeches has not been entirely exempt from objection; and Scudamore states, that while their benefit is very doubtful, they are liable to be followed in gouty subjects with erythematous inflammation of the skin, or even

œdematous swelling, with permanent debility. Paulmier, on the contrary, a French physician, trusted very much to the use of leeches in the treatment of gout, and apparently with success. He was indeed particular in the choice of the leeches to be applied,—that they be healthy, middle-sized, with small heads, and marked with gold-coloured stripes on the back,—marks which may be easily recognized to be those of the genuine medicinal leech. Of leeches of this description he applied 20 or 30, according to circumstances, and allowed the bites to bleed freely, but without immersing the feet in warm water. A troublesome itching, which sometimes is felt at the leech spots, denotes the cessation of the attack. The objection, that bleeding in this manner is followed by weakness, is frivolous; for every attack of gout is followed by weakness; and this is much less considerable when its violence has been moderated by suitable depletion. (Guilbert and Hallé, p. 65, §. 14.) Latham also informs us he never found them injurious. (P. 77.)

Cathartics.—Several authors have been equally hostile to the use of purgatives during the gouty paroxysm as to that of blood-letting. Cullen was in the habit of regarding their use as one of those means of debility which may favour the approach or prolong the continuance of a fit. Latham, however, inculcated the propriety of preventing constipation by the seasonable use of purgatives; Wallis impressed the necessity of unloading the stomach and bowels in the commencement of the fit; Dr Robert Hamilton of Lynn Regis, adverting to the impaired appetite and disordered digestion, employed them freely; and Sutton, guided by the same circumstances, and by the benefit resulting from the *eau medicinale*, regarded purging as the most powerful curative means that could be practised. In this difference of opinion between ancient and modern authorities, it is not very difficult to decide on the proper line of practice. Notwithstanding the apparent benefit resulting from the drastic effects of the *eau medicinale*, there is little doubt that profuse purging is injurious. At the same time, physiology teaches that the due and regular evacuation of the feculent contents of the intestinal canal is requisite; and experience shows that this is not only not injurious, but beneficial during the gouty paroxysm. It is also to be kept in mind, that the mucous membrane of the alimentary canal is not in a very healthy state during the gouty fits; and the secretions of this membrane are in general so much

altered from the state of health, as to require being corrected by suitable remedies.

To accomplish these objects, the choice of the practitioner will be directed to those medicines which act steadily and regularly rather than violently. Senna, aloes, or rhubarb, with or without calomel, to the amount of from three to six grains, castor oil, Epsom salts, in divided doses, or cream of tartar with infusion of senna, may be used in the ordinary way. Another useful remedy is the compound extract of colocynth (*Extractum Colocynthis Compositum*,) or the compound colocynth pill of the Edinburgh Pharmacopœia. Scudamore recommends occasional doses of calomel, with antimonial powder,—especially the preparation termed James' Powder, equal doses of which appear to cause less squeamishness, and to act with more certainty on the bowels, than the ordinary powder of the Pharmacopœia. The London gout cordial, consisting of rhubarb, senna, liquorice extract, and aromatics, digested in proof spirit, similar to the gout cordial of Boerhaave, is a popular preparation, which is not without its use as a purgative.

Tartar emetic.—The symptoms of gastric disorder, with which gout is generally introduced, show the necessity of exhibiting medicines which act on the stomach. Wherever there is squeamishness or sickness, flatulence, uneasiness or sense of weight in the stomach, and furred tongue, an emetic of ipecacuan will be advantageous. Dr Small found the benefit of this practice in his own case, and gave the preference to tartar emetic rather in large doses.* The propriety of this method is further shown by such cases as that related by Dr Pye, in which the disease seems to be terminated by spontaneous vomiting of very disordered bilious and mucous matter, perhaps mixed with an unhealthy gastric juice. Dr Small used to take, on the approach of a paroxysm, three grains of tartarized antimony, which produced vomiting, and always brought up large quantities of bile, and at the same time caused several copious alvine discharges, invariably with great relief to the severity of the gouty pain and heat. Afterwards, in consequence of the disagreeable effects of vomiting, he was led to try whether it could not be administered so as merely to purge and get rid of the bile by the intestines. This he thought he accomplished by uniting it with bark in the pro-

* Observations on the Gout. Apud Medical Observations and Inquiries, Vol. vi. Art. 20, p. 198.

portion of one grain of tartarized antimony, afterwards increased to two grains, to one drachm of bark. This was followed by a sedative, anodyne, and hypnotic effect, procuring quiet sleep, and it opened the bowels in the morning without griping.

To the use of tartar emetic in this manner there is one objection; and it is not inconsiderable. It is that the tartrate and bark act on each other so as to decompose the former. I do not say that by this decomposition the physiological or therapeutic effects of the antimony are annihilated; but they are certainly never impaired.

I have several times given tartrate of antimony in the treatment of gouty pains and swellings, and I have generally found it, given under certain restrictions, to be a powerful and useful remedy. It should not be exhibited until the bowels are either well or altogether emptied by means of eccoprotic medicines or enemata. After this it may be given at once, and is most conveniently administered in the following manner. Eight grains of tartrate of antimony are dissolved in one ounce of water, and a teaspoonful of the solution is given every second hour, while the pain and heat and swelling continue, or until some alleviation take place. Given in this manner it produces little or no vomiting; but acts either on the bowels or on the skin, sometimes on both; while the pain, heat, and swelling, speedily subside.

It has been believed beneficial to combine with purgatives such substances as may at the same time operate on the kidneys. With this view, Dr Scudamore recommends as particularly successful, a draught consisting of fifteen or twenty grains of magnesia, one or two drachms of Epsom salts, and from one drachm to a drachm and a-half of vinegar of meadow-saffron, suspended in any grateful distilled water, and sweetened with syrup, or fifteen or twenty grains of extract of liquorice. When the skin is hot and the urine loaded with pink sediment, twenty-six grains of carbonate of potass neutralized with fresh lemon juice, or in the act of effervescence, may be conjoined with it. In either case the draught is to be repeated every four, six, or eight hours, according to its effects and the urgency of the symptoms, and continued so long as the urine deposits sediment, or is of a high specific gravity.

With the same intention, the vinegar of meadow-saffron may be given alone, or combined with opium. A dried extract of this vinegar is also in use, which Scudamore recommends to be

given in the dose of a grain, equivalent to one drachm and a-half of the vinegar, in the form of pill.

To this head may be referred various preparations proposed as substitutes for the *eau medicinale*. Of these the most important are the vinous tincture of meadow-saffron, or root, or seeds, tincture of hedge-hyssop (*Gratiola officinalis*,) the combination of wine of white hellebore and laudanum, elaterium, with opium, &c.

The first of these remedies has been highly commended by Sir Everard Home, who represents it as a safe and active means of alleviating the pain, and shortening the duration of the gouty paroxysm. It is given in doses of 20, 25, or 30 minims, three or four times daily. According to Scudamore, it affords palliative relief to most persons, but proves a permanent cure to few. The wine of the seeds of meadow-saffron is a less active medicine than the preparation of the root, and less uniform in its strength.

Hedge-hyssop is well known to be capable of acting very powerfully on the stomach and intestines. Its tincture has been proposed as a substitute for the *eau medicinale*, of which it was at one time suspected to be the basis; but it is not uniform in its effects.

In 1811,* Mr Moore, suspecting the *eau medicinale* to be not a simple medicine, but compound, proposed as a substitute a mixture of three parts of the vinous tincture of white hellebore, and one of Sydenham's laudanum, forming a vinous tincture of hellebore and opium. The active powers of white hellebore (*Veratrum album*,) on the animal economy are well known. "Upon opening those who have died by its poisonous effects, the stomach discovers marks of inflammation with corrosion of its inner coat; and the lungs have been much inflamed and distended with dark blood." (Woodville, p. 276). The general correctness of this statement is confirmed by the experiments of Orfila. It was believed, however, that the poisonous effects might be counteracted, and good results obtained by proper combination with opium. Scudamore, nevertheless, asserts that it is too dangerous a medicine to be used in familiar practice, and can seldom be given to the gouty patient with perfect safety. Even in moderate and gradual doses, its action is liable to accumulate and cause serious hypercatharsis. Administered more freely, its effects are vomiting and purging, with burning pain of the bowels, great loss of strength, spasms, cold sweats, and, in quick succession,

* Letter to Dr Jones in Medical and Physical Journal, Vol. xxvi. p. 224.

tremblings, fainting, and every appearance of approaching death ; and instances are not wanting in which its use has been followed by the fatal event. On the other hand, its influence on gout is only palliative, and, notwithstanding the commendation which it has received from its proposer and others, its use, according to Scudamore, is quite inadmissible in the treatment of the gouty paroxysm.

About the same time, Dr Sutton proposed another substitute in wild or squirting cucumber (*Momordica elaterium*,) in doses of one or two grains, with forty or sixty drops of laudanum,—which he says he soon found to be an effectual remedy. It appears in general to act with considerable violence on the intestinal canal. Its effects in gout are precisely similar to those of the other acrid substances, palliative only ;—and the uncertainty of its operation, at one time unusually violent, at another almost inert, precludes its general adoption. As the substance, on which its active properties depend, is known to be *elatin*, it is perhaps to this that the practitioner must look for uniform results in its application to the cure of disease.

The propriety of using sudorifics in gout is doubtful. The most celebrated is the guaiacum, the power and success of which in relieving the pains of gout were first ascertained by the experience of M. Emerigon of Martinique. Of this preparation, I have already spoken above.

The use of Peruvian bark, which was suggested by Sydenham, appears to have been first employed by Held with great success, afterwards by Small in his own case, and more recently after the example of a surgeon-barber, by Lemnos and Tavaréz, two Portuguese physicians. Combined with local depletion by leeches, it is a very useful remedy according to Leroi.

Of narcotic remedies, opium or its preparations, henbane (*Hyoscyamus niger*), hemlock (*Conium maculatum*), hop (*Humulus lupulus*), lettuce extract (*Lactucarium*), extract of thorn-apple (*Datura Stramonium*), of wolfsbane (*Aconitum Napellus*), and of deadly nightshade (*Atropa Belladonna*), have been recommended by different patrons, with different degrees of confidence.

Though Cullen admits that opiates afford the most certain relief from pain, yet he remarks, that, when given in the beginning of paroxysms, they have been thought to occasion them to return with greater violence ; and the proper rule must be to administer them only, when the urgent symptoms have been subdued by blood-

letting, and when the intestines have been well emptied by emetics and purgatives. When this has been effected, opium may be given either in substance, combined with aromatics, as in the thebaic pill, or in solution, as in laudanum, black-drop, sedative liquor, or with ipecacuan, as in Dover's powder, or with antimonial or James' powder. In many instances, the black-drop, which is a solution of opium, or rather of morphia in verjuice with nutmeg and saffron, answers better than any other form of administration. The acetate of morphia, prepared according to the formula of Dr Thomson (Annals of Philosophy, June 1820,) appears to be a sedative and soothing preparation, and in doses of one-third or half a grain every three or four hours, till pain is relieved, is found of singular benefit. The muriate of morphia may be administered in the same manner and with similar effects.

Extract of henbane, (*Hyoscyamus niger*), seems to have much less power in relieving gouty pain; nor is much reliance to be placed in those of hemlock (*Conium maculatum*), or hop (*Humulus lupulus*), notwithstanding its strong recommendation by Mr Freake. Of the extract of the garden lettuce, Scudamore speaks favourably; but the power of thorn-apple he represents to be inferior to that of opium. Deadly nightshade and wolfsbane are inefficacious.

Local Applications.—For assuaging the severity of the local pain and heat, various applications have been at different times proposed. The simplest and safest method, it is believed, is to envelope the part in flannel, soft fur, swan-down, eyder-down, or, what is better than either, soft wadding. These applications, however, are not always attended with the expected relief, and hence various others of more active character have been recommended and employed.

Fomentations and Cataplasms.—Warm fomentations are naturally used after the bleeding from leeches; and even the hot cataplasm of linseed, chamomile flowers, or any similar retainer of heat, may be used.

A much commended remedy of this kind is supposed to be found in the cataplasm of Pradier, which is formed by covering a linseed poultice with a considerable quantity, about two ounces, of an aromatic balsamic tincture. In this, the foot and leg are enveloped, and the whole being covered with flannel and secured by a roller, is allowed to remain so for twenty-four hours. The first effect of this, according to Nysten, Hallé, and Chausier, is to induce a sort of calm; restlessness disappears, and

sleep ensues; if it has been applied at the height of the paroxysm, pain is speedily relieved, and sleep follows. On removing the poultice, the skin appears soft and moist; and the scarf-skin, as in similar instances, is detached and broken down in the form of a thick, white, suet-like exudation. In the course of subsequent applications, this destruction of the scarf-skin is most abundant, more extensive, and accompanied with more complete solution; a peculiar fetid smell is said to issue from these poultices at the moment of removal, and the occurrence of this smell, which is characteristic of the secretion from gouty limbs, is the first index of amelioration. Another effect of these cataplasms is said to be pain, with a sense of burning in the sole of the foot or heel, which, however, is said to take place either in gouty or sound limbs, but not when the tincture is omitted. It may be prevented by the interposition of one or two folds of fine linen or muslin.

Spirituous Embrocations.—Guilbert and Hallé proposed to substitute compound tincture of gentian for the complex aromatic tincture of Pradier. Scudamore found a very useful and effectual application in a poultice of grated bread, moistened by a lotion or embrocation rather of one part spirit, and two parts of camphor mixture, rendered tepid, not hot, by placing the basin in which it is prepared in a larger one containing hot water.

Oleaginous Substances.—From adopting the hypothesis of Clopton Havers regarding the vitiated, dried, or inspissated state of the synovia in gout, several physicians, and among others Rogers and Stukeley, strongly recommended the external application of oil, or the complete immersion of the gouty foot in that fluid. The effect of this procedure was always to diminish much the morbid heat.*

A principal object in relieving the severity of the gouty paroxysm has been supposed by several to be the reduction of morbid temperature, or, to speak more accurately, the diminution of the sensation of increased heat; and with this view various methods have been practised by different authors. The most obvious, the application of cold water or ice, or immersion of the foot in cold water, was universally practised by Hippocrates; in modern times by Harvey in his own case; afterwards by Van der Heyden and others; and was attempted to be revived by Kinglake in this country, and Giannini in Italy. By the English physician, who regarded gout as a local not a constitutional

* Of the Gout. By William Stukeley, M.D. &c. London, 1734. p. 56-69.

disease, this practice was consistently enough carried to a very great length. He recommended it to be applied topically to the affected parts, either by means of wetted cloths, by gentle showering, or by actual immersion; the cold water to be frequently renewed as it becomes heated by its contact with the limb; and this course to be pursued until the painful sensation of burning heat subsides, and with it the accompanying redness and swelling. This practice has not been generally adopted. Neither the example of Harvey, nor the commendations of Van der Heyden have been able to render it popular. The authority of Heberden, though not absolutely against it, is not in its favour; Parkinson, Parry, and others remarked its injurious effects; and Scudamore states the relief never to be so certain as the danger. There are but few instances in which the gout is so local as the principle of the practice supposes; and if it is in any instance truly efficacious, the proper circumstances which indicate its employment are so imperfectly known, that, as a general rule, it can rarely be safe. Guilbert and Hallé recommend a modification of it, by allowing cold water to fall slowly, drop by drop, on the inflamed surface, for a longer or shorter time, until the sensation of morbid heat is diminished or removed.

A safer method of diminishing morbid heat is found in the application of spirituous or ethereal embrocations. Scudamore recommends the mixture already mentioned, consisting of one part alcohol and two of camphorated mixture, to be applied tepid by means of linen rags to the inflamed parts. The speedy evaporation of the alcohol is restrained by the camphor mixture. A spirituous lotion or embrocation, which I have found convenient, is made by combining equal parts of the *aqua acetatis ammoniae* and common spirits, or even equal parts of vinegar and spirits.

Revellents.—Revellent remedies, or those which act by counter-irritation, are not well adapted for the treatment of the acute and painful state of the disorder, when the foot is hot and tending to swelling. Before the paroxysm has come on, while there is stiffness and uneasiness of the foot, it may be desirable to apply a sinapism or a blister. When applied while the inflammatory action is established or proceeding, it has been sometimes apprehended to be dangerous by inducing bad sores or a tendency to gangrene, and by Cullen, as apt to render the disease retrocedent.

Notwithstanding this objection, blisters were recommended by Musgrave and Rush, and employed by Stevenson, and are occasionally used at present.

Both epispastics, however, and rubefacients, seem most suited to the chronic form of the distemper, and to those instances of the retrocedent gout, where the disease seems to fix on some important internal organ.

The application of cauteries has been a practice of some antiquity. Hippocrates prescribed raw flax to be burned in the neighbourhood of the painful joints; but there is strong reason to believe it was more in the chronic than in the acute stage of the disorder. The Chinese and Japanese have been long in the habit of burning over gouty joints, it is said, the downy matter of a species of artemisia, called moxa; and from their practice the remedy was introduced into Europe by the early Dutch practitioners, especially Buschoff and Ten Rhyne, both of whom speak in the highest terms of the certainty of its therapeutic effects. *

If it be deemed expedient to employ this revellent, it may be formed by means of wadding previously immersed in a solution of nitrate of potass, and rolled up firmly in the shape of a cone.

Specifics.—Before concluding this part of the subject it is requisite to notice those pretended remedies which are supposed to exert a specific influence in curing gout, and the composition of which is unknown. In doing so, it is unnecessary to extend our observation to all the attempts that have been made in various ages to impose on the natural credulity of mankind. My remarks are to be confined to three remedies which have appeared since the beginning of the present century, the *eau medicinale* of Husson, the tincture and pills of Wilson, and the specific of Reynolds.

I. The *eau medicinale*, or medicinal water, is said by Dr Jones, who made its history known in 1810, to have been discovered in France about 1770 by the Chevalier D'Husson, an officer in the French service, who pledges his honour that it is prepared from one plant, the virtues of which were previously unknown, and affirms that it is a sovereign remedy for gout and almost every other disease incident to the human frame. In 1802, the existence and virtues of this medicine appear first to have been made known by Dr Chretien of Montpellier to Dr Jones, while he was passing the winter in that city

* Two Treatises, the one Medical of the Gout, &c. by Herman Buschoff, Senior, of Utrecht, &c. Part second, London, 1676. Wilhelmi Ten Rhyne, M. D. Dissertatio de Arthritide. Lond. 1683. Works of Sir William Temple, Vol. iii.

with Mr Crawford of Auchnemes. In 1808, when this gentleman was attacked with gout in both hands, he took a full dose according to the prescribed rules, which was followed by a speedy cessation of pain, and entire removal of the paroxysm within forty-eight hours. Several of the friends of Mr Crawford having tried it with the same result, the virtues of the *eau medicinale* became generally known. It is chiefly, however, to the example of Sir Joseph Banks, aided by the encomiums bestowed by his surgeon, Sir Everard Home, that this nostrum is indebted for its celebrity. In February 1810, the Baronet had a severe and threatening paroxysm of gout, for which, at the recommendation of Earl Spencer, he took half a bottle of the medicine, with the effect of reducing the pulse in one night from 94 to 62, and removing the gouty pains from every joint in the inverse order in which they had advanced. Forty-eight hours after the first dose the remaining half of the bottle was administered, and in the next twelve hours five alvine evacuations took place. The favourable result induced Sir Joseph Banks not only to use the *eau medicinale* as an alterative, but to have recourse to it on every future occasion; and it afterwards came into general use as a remedy for gout.

The merits of this remedy, however, have been much overrated, and by none more than by Sir Everard Home, who inferred that it was the same as the vinous infusion of meadow-saffron, because both, according to him, were specific remedies for the gout. Subsequent experience has not confirmed this opinion. Scudamore, especially, has shown distinctly that the medicinal water, though it has greater influence over the gouty paroxysm than the tincture or vinous infusion of meadow-saffron, is nevertheless not only inadequate to the cure of the disease, but is liable to induce alarming weakness, and convert it into maladies not less formidable. The sensible effects on the animal body are squeamishness and sickness not amounting to vomiting, after some hours copious fluid stools, proceeding in some instances to violent purging (*hypercatharsis*), with alleviation or removal of the gouty pains. But these effects are neither uniform nor certain. In some instances several bottles have been taken without any sensible influence. In others its administration is followed by dreadful sickness and vomiting, copious purging, faintness, loss of pulse, coldness, trembling, and every mark of approaching dissolution.* In other instances, again,

* Mr Robert Adams, *apud* Medical and Physical Journal, Vol. xxiv. p. 364; Ring, p. 176; Burroughs, *apud* Medical and Physical Journal, Vol. xxvi. p. 499.

when it does not produce immediate bad effects, it is slowly followed by giddiness, with a sense of sinking and faintness, weakened or torpid condition of the stomach and bowels, from which no stimulants appear capable of rousing them, tremblings, numbness, coldness, and even œdematous swellings of the limbs. A remedy so capricious in its operation, and so pernicious in its effects, can never be employed either with confidence by the physician or safety to the patient.

The composition of the *eau medicinale* is unknown. It was analysed in 1782 by MM. Cadet and Parmentier, who came to the negative conclusion, that it contained no mineral substance, but was a vinous infusion of some bitter plant or plants.

Scudamore thinks the solvent may be a French wine; and while its colour resembles the extract of gentian, he recognizes the bitter taste of that herb with a slight flavour of opium. Mr Want, from various experiments, conjectured that it consists of the bulb of meadow-saffron infused in sherry or Lisbon wine. *Lastly*, Dr Wilson, the proprietor of a similar secret medicine, asserts from various experiments, that the *eau medicinale* is an infusion of the expressed juice of the flowers of meadow-saffron in one part of brandy. (Introduction, p. 34, 35.)

II. The next secret medicine for gout is the tincture and alterative aperient pills of Dr Charles Wilson of Yoxford. The proprietor of this nostrum informs us that, after a long series of laborious and expensive experiments, undertaken with the view of discovering the composition of the *eau medicinale*, he succeeded, in the autumn of 1811, in discovering a preparation which, with all the virtues, might possess none of the evils of that medicine. This preparation, however, which he named the Medicinal Water, he thought fit to abandon; and in consequence of becoming acquainted, in the course of his researches, with several vegetable substances unknown to pharmacy in general, he was led to the preparation of that tincture which is known by the name of its proposer. The effects of this medicine vary in different persons, and in the same person under different circumstances, according to the testimony of Dr Wilson himself. For the most part it acts as a sudorific, a diuretic, and a cathartic; and as these modes of action are salutary, they may be encouraged by the use of diluent fluids, as barley-water, water-gruel, whey tea, or by drinking occasionally a cup of weak ginger-tea, or of an infusion of peppermint, penny-royal or sage. The dose varies from 50 or 60 minims, equivalent to 100 drops,

to 40 minims = 80 drops, 30 minims = 60 drops, or 20 minims = 40 drops. The large dose is to be taken only by the robust and unbroken, when under a severe paroxysm; smaller doses to females, delicate persons, or those advanced in years, or with impaired constitutions. In a few hours after taking the tincture, especially in the first dose of 50 or 60 minims, the patient usually begins to feel some abatement of pain, and before morning, obtains some comfortable sleep, from which he awakes almost free from suffering. If any painful sensations continue to be experienced after forty-eight hours from the time of the first dose, it is to be repeated. If properly administered the pain and redness are said to abate rapidly. Dr Wilson promotes the operation of his tincture by the use of pills, a principal ingredient in which, is an extract from the tincture, and by various other draughts, for which he gives formulæ.

The composition of this medicine is concealed. Dr Scudamore, however, from various experiments on it, and from observation of its physiological effects, both in the human subject and in dogs, is disposed to regard it as a concentrated preparation of meadow-saffron dissolved in diluted spirit.

Notwithstanding the extravagant praises bestowed on it by the author and his friends, it is never to be doubted that it is liable to the same objections which apply so forcibly to the *eau medicinale*. Though Scudamore admits that it exercises a speedy control over the local symptoms, and in a greater degree than either the spirituous or the vinous tincture of meadow-saffron, (209), yet this relief is palliative only, and does not affect the constitutional cause of the disease; but, on the contrary, by inducing great general weakness, rather disposes it to fresh attacks, and, by its effects on the alimentary canal and general system, produces great and lasting weakness of the nervous system, and of the muscular organs. It is said, notwithstanding these manifest evils with which its use is fraught, to have been the medicine resorted to by King George IV. when under the influence of the disease, and to have been recommended from this high authority to all the nobility. (Wilson, Introductory Observations, 50.)

III. A third secret remedy for gout is Reynold's specific. Of the history of this we have not very certain information. Scudamore thinks there is good evidence to believe that it is a preparation of meadow-saffron in rum, with colouring matter,—more diluted than Wilson's tincture, but most probably a concentrated warm infusion. Dr Wilson also, though he is at great pains to prove

its inferiority to his own medicine, asserts that it is merely Mr Want's tincture of meadow-saffron, coloured with a small quantity of syrup of red poppies, and flavoured with rum. Whatever be its composition it is equally inadequate to cure gout, and equally unsafe to be used as those already mentioned. When given in small doses it exercises no certain influence over the symptoms; in larger quantities it operates violently both on the stomach and bowels. In his eagerness to demonstrate its pernicious effects Wilson adduces a case in which an over-dose proved fatal. (123.)

C. I have now to advert to the treatment required to be pursued in the irregular or abnormal forms of the distemper.

a. In the atonic or latent form of the disorder, in which the chief symptoms appear in the shape of dyspeptic symptoms, nervous and sometimes hypochondriacal complaints, it has been believed that in general the best treatment consisted in supporting the tone of the stomach by means of tonics, as Peruvian bark, astringents or bitters, and the mineral tonics, as iron, and at the same time allowing the use of animal food and wine to a moderate extent. To the first Cullen was opposed, because he saw that in general their frequent use was followed by a degree of atony as great and as effectual as by the guarded exhibition of these remedies. To the use of the rust of iron he was more indulgent, as he thought there was less risk of the patient taking it in such quantity as to be injurious.

It must be observed, however, that whenever in the gouty the stomach presents symptoms of atony, it is both unphysiological and unsafe to attempt the removal of these symptoms by means of tonics or stimulants of any description. These symptoms are indications that the stomach has been already overworked and urged beyond its natural powers, and that, instead of having its tissue constricted and its vessels congested by tonics and astringents, it ought to be required to perform much less duty, the amount of food and drink ought to be diminished, and their quality altered until the symptoms of atony subside; and the patient, by salutary fasting, and regular exercise, recovers some degree of natural appetite.

Even the animal food, and wine or spirits, often conceived requisite in this state of the stomach, are both irrational in principle, and dangerous in effect. It gives an organ already much enfeebled much more to do than it is adequate to accomplish. The organ is overloaded; fermentation takes place; its secretions

become vitiated ; and this disorder is propagated into the *duodenum* and *ileum*, and causes disorder along the whole alimentary canal. It is then that tonics and stimulants are employed, invariably with the effect of increasing the evil ; and as there is a limit to the action of these agents, a state of complete atony generally follows.

A much more judicious and effectual method of removing this state consists, *first*, in the diminution of the allowance of food and drink and changing its qualities ; *secondly*, in the employment of antacids and laxatives ; and *thirdly*, in the use of regular exercise with cold sponging or the cold bath, if no other symptoms contraindicate its use.

Wine and spirits are always unsafe in this state of the system, and commonly furnish temporary palliation.

In some instances in which these measures are inadequate, it is advantageous to administer emetics, and afterwards minute doses of ipecacuan or tartrate of antimony.

Many other remedies, sometimes of a popular or domestic character, have been proposed and used against the symptoms of latent gout affecting the stomach. Dr David Clerk recommended in 1771 the employment of a strong infusion of tansy leaves (*Tanacetum vulgare*), a remedy which had indeed formerly enjoyed some reputation as an antidote to gout. The strength of the infusion is not mentioned, but this is of no great moment. Dr Clerk used to give about four ounces of the infusion for a dose, or two ounces, if the stomach would bear no more. The effect of tansy infusion varies according to the amount taken. If about half a pint be taken at bed-time, it sometimes opens the bowels gently. In other instances it increases the amount of the urinary secretion.—(Essays Phys. and Lit. iii. 452.)

Notwithstanding the apparent alleviation that seemed to follow the use of this plant, it has never come into general use ; nor do we need to expect from its use any more beneficial or more permanent effects than result from the use of other remedies.

In that variety of atonic or latent gout, in which the symptoms appear mostly in disorder of the functions of the lungs and heart, it is not always so easy to say what is the best method of treatment. The difficult respiration and cough are often supposed to be merely spasmodic, and, therefore, to be most readily relieved by the employment of antispasmodics and opiates, as sulphuric ether, valerian, or paregoric elixir. This conclu-

sion, however, is only conjectural. There seems strong reason to believe that, if there be not positive inflammation, there is at least vascular congestion and impeded motion of the blood, through the extremities of the pulmonary artery and veins. Upon this view a blood-letting to some amount would be the best remedy; and it would be beneficial to apply rubefacients and epispastics over the breast and sides, and on the back in the space between the shoulders. When the symptoms are those of gouty *angina pectoris*, it is difficult to say what should be done. The *angina* is very generally a symptom of disease of the heart; and until that is removed, the symptom will be incapable of being prevented from recurring at intervals. In most instances, however, of this form of latent gout, it will be well to draw blood sparingly and cautiously, to apply revellents to the chest, and to put in force the use of the diffusible stimulants in a cautious manner. As all these symptoms, which come on only at certain periods, owe their origin to a certain morbid state of the system, and sometimes the presence of organic changes, which, though not sufficient to induce constant deranged action in the organ, are still adequate to disturb its function at intervals, it is requisite first to rectify, if possible, the morbid diathesis by proper diet and regimen, and, if the symptomatic effects be not thus removed, to have recourse to periodical evacuations and revellent remedies. Local bleeding by means of cupping over the chest, or leeches over the region of the heart, and revulsion by means of frequent blisters, or the insertion of a seton or issue, furnish the most likely means of putting a stop to these symptoms. In some instances a profuse spontaneous hemorrhage has been followed by complete disappearance of all these symptoms of anomalous internal gout.

c. When headach, giddiness, or confusion of thought take place, and are suspected to depend on the operation of latent gout, blood should be drawn from the arm or the head, by cupping or by leeches, the scalp should be shaved and kept cool, and cathartic medicine should be freely administered until the symptoms subside. If distinct *hemiplegia* come on, or loss of sensation or motion, and proceed to stupor and coma, it is so much the more necessary to withdraw blood from the system and from the head, pretty largely, and to adopt all the therapeutic measures already indicated, and afterwards to be mentioned, as if no gouty diathesis were present.

In the retrocedent or repelled form of gout, whether the disease affect the stomach, the lungs, the heart, or the brain, in general the safest practice is instantly to employ depletion.

The case of retrocedent gout affecting the stomach has been generally supposed to be best treated by means of the diffusible stimulants, as strong wines given warm and spiced, ardent spirits, as brandy, or some of the hot spirituous tinctures, as tincture of assafoetida, the ammoniated tincture of valerian, ether, ether and opium, paregoric, either Scottish or English, musk and camphor. It has been said also, and is allowed by Cullen, that large quantities of ardent spirits may, in this state of the stomach and system, be given with impunity; for instance that two pounds of brandy or strong rum are requisite, in such circumstances, to alleviate the sufferings of the patient, and remove the symptoms.

Cullen has also admitted that large doses of opium, for instance to the amount of ten grains twice daily, were requisite to be administered, in order to relieve the intensity of the symptoms; and that these large doses produced no subsequent injurious effects. (580.)

I cannot help thinking that the propriety of the whole of this practice is very questionable. In mild cases of retrocedent gout in the stomach, where there is evidence of flatulent distension of the organ, a little ardent spirits may be useful as a carminative in expelling flatus, and thus relieving the symptoms. But this is very rarely the case with gout in the stomach. It comes on suddenly like an acute violent excruciating pain, as if the organ were suddenly lacerated, or tied, and drawn together with a tight cord, and it causes the patient to scream out, howl, and bellow, with perfect agony. These symptoms are always most certainly controlled and assuaged by immediate blood-letting from the arm, and the subsequent employment of active cathartics. The blood-letting requires to be in general large, often to the extent of twenty-five or thirty ounces; and the patient usually bears it well, and without any indication of faintness.

One advantage of treating this sort of attack by means of blood-letting, is, that it is then not only easily and speedily controlled, but is less likely to recur, than when other means are used. When, on the other hand, it is treated by the diffusible stimulants, as spirits, or narcotics, as opium, all of which exert

less influence over it than blood-letting, it is liable to recur more or less speedily, and to prove fatal.

On the nature of this affection, it is difficult, I have above said, to give an opinion, which might guide us in treatment. But it may be observed, that the circumstance of the large quantities of ardent spirits, and the large doses of opium, which are said to be required, and to be taken without producing their wonted physiological effects, furnishes a clear proof that the stomach has lost its usual sensibility; that it is as it were physiologically dead; and that the state of torpor as it were, into which it has fallen, must be attempted to be removed by other remedies, before the spirits or the opium can be expected to operate. This indication is fulfilled by the blood-letting, after which much more moderate doses either of spirit or opium, if in any way required, will be necessary. The safest plan, however, is, if possible, to avoid entirely the use of these stimuli. The use of these articles, indeed, by aggravating the diathesis, and increasing congestion in the brain, is liable to convert the gout in the stomach into gouty palsy or apoplexy.

When retrocedent gout attacks the lungs, and gives rise to asthma, as it is named, which is too often a bronchial inflammatory attack, the proper course is to employ blood-letting from the system, large doses of tartarized antimony, blisters and sinapisms externally, and all the means calculated to relieve an oppressed state of the pulmonary circulation.

When, after the disappearance of gouty pain and redness of the extremities, symptoms of giddiness, headach, drowsiness, stupor, or palsy come on, or palsy with coma, all the usual means of counteracting the fatal event ought to be adopted with the utmost promptitude and energy. Some have doubted the propriety of depletion, as apt to depress too much the vital energies of the system. This, however, is a vague, incorrect, and unphysiological mode of expression. No doubt can be entertained that the gouty action, whatever be its nature, when affecting the vessels of the brain, will, by its disorganizing consequences, much more speedily, seriously, and completely depress the vital energies than any means of depletion that could be adopted. If the attack is to be moderated and cured in any way, it will be much more certainly cured by means of depletion than by any other kind of remedies. In general, therefore, the safe plan is to detract from the arm, exactly as if no gout were present,

twenty, twenty-five, or thirty ounces of blood, to shave the head, detract blood by cupping, if the symptoms do not speedily abate, and to administer purgative *enemata*, so as to empty the intestines thoroughly. By this course the practitioner gains time; and averts the immediately fatal termination of the attack. As soon as this is done, and the cerebral symptoms are relieved, it happens sometimes that a slight attack of regular gout appears in one or both feet. But whether this be the case or not, it is always desirable, in all the forms of retrocedent gout, to immerse the lower extremities in the sinapised foot-bath, or in strong solution of hot salt water, and to apply sinapisms over the feet and legs.

In the Misplaced Gout, or that in which the gouty action causes true inflammation of an internal organ, as the lungs, the brain, or the stomach, it is impossible to doubt the propriety of blood-letting; and, in all instances, it is requisite to employ that evacuation with the other divisions of the antiphlogistic regimen, in sufficient extent, to control the symptoms of local inflammation, and in the same manner as if no gouty diathesis were present, and as if the inflammation were idiopathic.

I have now concluded what I think it requisite to say on the treatment of Gout, both in its regular and in its anomalous forms. I must not quit the subject, however, without observing, that when we take a comprehensive view of the distemper and all its phenomena, it must appear that, however variously we classify and designate these phenomena, the symptoms named Regular gout are mere external signs of the presence of a morbid state of the circulation of several internal organs, not merely the liver, as maintained by Scudamore, but the whole alimentary canal, the lungs, the heart, the kidneys, and even the brain and spinal chord. In the vessels of every one of these parts there is a morbid principle, which may evince its existence either by the marks of inflammatory action in the extremities, or symptoms of disorder in one or more of the internal organs. The great attention, therefore, both of the practitioner and the patient should be directed to the abatement or eradication of this principle, and the removal of its effects by means of suitable remedies, dietetic, regiminal, and medical.

CHAPTER VII.

DISORDERS OF THE ALIMENTARY CANAL AND THE
NUTRITIVE FUNCTION.

It has been a question of some difficulty to determine what tribe of disorders ought to be placed next in the arrangement of diseases observed in the present work. After considering the point with some care, it appears to me that the consideration of the Disorders of the Alimentary Functions can no longer be deferred. It must have already appeared manifest how much the presence and degree of these disorders operate as predisposing causes to various other maladies, especially affections of the brain, affections of the secreting glands, and affections of the skin; and the history and etiology of gout furnish evident proofs of the influence of disorder of the digestive functions in paving the way for the different forms of that distemper. It may be further said, that, of the diseases yet to be considered, several depend very much on the state of the alimentary canal, and its secretions and excretions. For these reasons it appears necessary here to introduce the consideration of the disorders most common to the alimentary canal, and by their history to form an introduction to the consideration of several diseases afterwards to come under notice.

In the diseases which are now to come under consideration, derangement of some of the processes concerned in the alimentary function forms a more or less conspicuous feature. This function is so extensively connected with many others of the animal economy, that it is almost never disordered without giving rise to various morbid states in those both immediately and remotely connected with it. It is in this manner that when digestion, or, to speak more generally, the alimentary function, is subjected to any derangement whatever, it may give rise to symptoms not only of disorder in its own actions, but in those of other functions, as the circulating, the secreting, the sensitive, the locomotive, and the nervous functions.

The alimentary function consists of several different processes which take place in different parts of the alimentary canal. Each process is liable to suspension, interruption, or other derangement, in consequence of the operation of various causes; and according to the degree to which these changes may take

place, to the greater or less number of them, to their occurring separately or in combination, to the degree in which one may take place more than another, to the duration or continuance of the derangement, to the nature of the subject of derangement, and other circumstances, the effects will vary and constitute different forms of diseased action. It is from these circumstances that disorders of this class are very complex in the features which they assume, and that it is extremely difficult to ascertain with accuracy or precision the exact causes on which these derangements may depend.

It is, however, indispensably necessary to define in some mode the disorders to be referred to this head; and I shall attempt it in the following manner. When the alimentary function is disordered, it gives rise either to symptoms more or less accurately referred to the organs in which it takes place, or to symptoms manifestly taking place in other organs. To the first head I refer the complaints generally termed indigestion, to which I apply the general name of *Dyspepsia*. This includes not only the simple form of indigestion, the *Dyspepsia* of authors; but the stomach-ach (*Gastrodynia*); the heart-burn (*Cardialgia*); the water-brash (*Pyrosis*); the more general affection termed chronic weakness by Withers, *Asthenia* by Sauvages and Willan, and nervous weakness by many other authors; and the green-sickness (*Chlorosis*). To the second head may be referred Atrophy or pining; Bloodlessness (*Anaemia*); Hypochondriasis; the state which predisposes to *Hysteria*, all those derangements in the organs of sensation, voluntary motion, and involuntary motion, which are not attended with organic change, and to which the general name of nervousness has been popularly and even professionally applied; and that morbid state of the renal secretion which has been named *Lithiasis*.

These forms of disorder are so intimately connected in the causes from which they arise, that it is difficult to distinguish any one morbid state of the alimentary canal or of its individual parts more than another. All that we can pretend to do is to enumerate generally the circumstances, which individually or conjointly may contribute more or less powerfully to cause particular forms of derangement of the alimentary function.

In the alimentary function two sets of agents are concerned; the primary or essential, and the secondary or accessory. Almost all the conceivable causes of disordered digestion may be referred to changes in one or other of these two sets of agents.

Of the derangements incident to the primary or essential agents of alimentation, the following subdivision may be given :

1. Changes in the state of the mechanical process of mastication and insalivation. To this head may be referred loss or want of teeth, swallowing hurriedly and without due mastication, spitting out the salivary fluid, unusual secretion and waste of this fluid, as in the case of those who smoke or chew tobacco, and disorders of the salivary glands.

2. Changes in the state of the gastric mucous membrane. Congestion, injection, inflammation, catarrh, or other unhealthy states of this membrane, are not unfrequently found to produce very obvious marks of indigestion. Such states may be suspected from tenderness, pain, or weight of the epigastric region, sickness or vomiting after taking ordinary food, regurgitation, rumination, and the frequent discharge of viscidropy mucus.

3. Changes in the state of the gastric muscular fibres. Not much is known of the specific nature of these changes, or of the extent to which they may proceed. But it is reasonable to suppose, that the fibres may be weakened, relaxed, or otherwise disordered, as other muscular fibres are in various parts of the body. That they are affected with spasm is certain. Whether they ever become paralytic is highly problematical. In various long continued disorders, they become pale, then flaccid, and easily lacerable, and may then be said to be in a state of atrophy. Whether such changes depend on a morbid state of the fibres primarily, or arise from some affection of their nervous twigs, is of no great moment. There is reason to believe that the irritable, or inherent power of the muscular fibres is first impaired in mere weakness of the muscular coat; and that the nerves, as in other organs not concerned in voluntary motion, have little concern in these morbid changes. A very obvious cause of such impaired strength is found in the frequent overdistension to which the muscular fibres of the stomach are necessarily exposed.

4. Changes in the state of the gastric capillaries and of the gastric fluid. Presuming that the existence of this fluid is demonstrated by the experiments of Reaumur, Hunter, Stevens, Spallanzani, Tiedemann and Gmelin, Leuret and Lassaigne, and Beaumont, it can scarcely be doubted that it is a secretion from the capillaries of the organ. I shall endeavour to show that it is secreted by blood-vessels, and deposited in an apparatus of minute parallel tubules, from which it oozes into the cavity of the stomach when aliment is introduced. There is little doubt

that the minute vessels of the stomach are liable to various morbid states, and that these produce corresponding changes in the qualities and quantity of the gastric fluid. That changes in its qualities take place, by which it is rendered less fit for the purposes of digestion, appears also to be well established; although the precise nature of these changes, and the circumstances on which they depend, are not known with accuracy. I shall state here the facts ascertained.

From the description of the organization of the villous membrane of the stomach, by Sir Everard Home and Dr Sprott Boyd, combined with the facts regarding the secretion of the gastric fluid established by the observations of Dr Beaumont on the stomach of Alexis St Martin, we are enabled to form more distinct ideas than formerly, not only on the mode in which that secretion takes place, but on the derangements to which it is liable, and the causes which tend to derange the secretion.

From careful microscopical observation on the villous membrane of the human stomach, combined with comparative observation on that of the pig, it results that the former consists, immediately beyond the cardia, of a series of honey-comb-like spaces, about $\frac{1}{80}$ th of an inch in diameter; and about half an inch from the cardia, these give place to small regular cells or cellular spaces, which may be said to distinguish the structure of the whole inner surface of the organ. When the mucous membrane is extended, they appear regular in shape and size, varying from $\frac{1}{200}$ th to $\frac{1}{300}$ th part of an inch in diameter, and are smaller in the young subject than in the adult. Towards the pylorus, the mucous membrane, which is thin throughout the great or splenic division of the stomach, becomes somewhat thicker, the size of the cells is increased, being about $\frac{1}{100}$ th of an inch in diameter, and an appearance resembling that described by Sir Everard Home is perceptible. The wall of each cell is represented by Home to rise a little above the level of the surrounding surface, and to be cleft into about 10 or 12 rounded segments, forming a complete fringe round the mouth of the cell. Dr Boyd did not find these projecting segments to be so numerous, nor did he recognize any regular fringe, but merely here and there a permanent elongation of the membrane like a common villus rising from the line of partition between two adjoining cells.

The floor or surface of each cell presents the appearance of numerous circular openings, as of the terminations of so many

cylindrical tubes; and in making a section of the mucous membrane, it is observed to be composed of numerous *striae* or fibres disposed close and parallel to each other, and running perpendicularly from the free surface of the membrane to the cellular coat beneath.

Partly from direct examination of the mucous membrane of the human stomach, partly from comparative observation on that of the pig, Dr Boyd ascertained that these fibres or *strice* are minute tubes lying parallel to each other; one extremity of which is connected to the submucous cellular layer, while the other opens by a minute orifice on the surface of the mucous membrane, and thus constitutes the minute apertures observed in the cells. These tubes may be considered as the excretory ducts of the gastric fluid, and named gastric tubules; (*Tubuli gastrici.*)

Though the connection of these parallel tubes with blood-vessels be not demonstrated in the human stomach, it is known that in the pig, they terminate by shut extremities amidst a close plexus of capillaries, from which vessels arise, and running parallel to the tubes in the intermediate uniting cellular tissue, ramify minutely on their surface.

It can scarcely admit of doubt, that from these tubes flows the liquid called gastric juice or gastric fluid. Dr Beaumont was unable to distinguish apertures or pores in the gastric mucous membrane, by the aid of the best microscopes that he could obtain; and as the observations of Dr Boyd were made subsequent to the appearance of the first, or American edition of his work, he had not an opportunity of availing himself of the aid of the facts ascertained by Dr Boyd, to supply this deficiency in the train of his own inquiries. But his account of what was uniformly observed in the stomach of St Martin, not only confirms the statements now given, but is itself explained by them.

Whenever alimentary matters, or any irritant, mechanical or physiological, are applied to the interior of the stomach, and the effect is observed through a good magnifying glass, innumerable minute lucid points, and very fine nervous or vascular papillæ, can be seen rising from the villous membrane, and protruding through it, while there oozes a pure limpid, colourless, slightly viscid fluid. This appearance takes place conspicuously only during alimentation, that is, when food is conveyed into the stomach. The lucid points, which then become visi-

ble, Dr Beaumont inferred to be the terminal apertures of the excretory ducts of the gastric vessels. They are manifestly the orifices of the gastric *tubuli*, discovered and described by Dr Boyd.

The fluid thus discharged is invariably at the moment distinctly acid, and at once reddens litmus-paper, and even tastes acid. Yet the mucous membrane of the stomach does not, when the fluid is not flowing, present marks of acidity. The gastric fluid is known to contain hydrochloric acid.

The gastric fluid is made to ooze abundantly from the *tubuli* upon the introduction of alimentary articles, and the application of any mechanical stimulus, as the bulb of a thermometer. To the latter stimulus, however, it flows less freely and abundantly than to the former, is a mere local oozing at the part touched or irritated, and it is not only more scanty and often mixed with gastric mucus, but it is attended or followed by painful or uneasy sensations, similar to those of transitory faintness. With the introduction of food it is totally different. The stimulus to the secretion of gastric fluid is generally diffused over the whole inner surface of the organ; it flows copiously and generally; is more abundant within certain limits, as the food is abundant; and mixes itself intimately with the alimentary matters. It must be also remarked, as a beautiful provision of nature, that this profuse secretion of gastric fluid, instead of being accompanied with the painful sensations in the stomach, and the feeling of faintness ensuing on the excitement of its secretion by mechanical means, is attended with sensations of increased strength, comfort, and enjoyment.

Besides the more or less profuse secretion of the gastric fluid on the introduction of food into the stomach, some other changes in the state of its mucous membrane, its vascular apparatus, and its muscular coat take place deserving notice.

When the stomach is empty, the *rugæ* or folds of the villous membrane appear irregularly folded on each other, in a quiescent and motionless state, of a pale-pink colour, with the surface lubricated with mucus. On the introduction of aliment, the action of the vessels is increased, the colour of the villous membrane is brightened, and the vermicular motions produced by the action of the muscular fibres are excited. The *rugæ* are chiefly produced by the contraction of the muscular over the

mucous coat, and, therefore, are mostly seen when the stomach is either partially or wholly empty.

Such is the state of the gastric membrane and its secretion in health. When from any cause it is diseased, the appearances are considerably different.

When the system is under the influence of fever or febrile disorder, whatever be the cause;—suppressed perspiration, overloading the stomach with food, excessive excitement by stimulating liquors, fear, anxiety, affliction, anger, or whatever depresses or disturbs the influence of the nervous system;—the gastric villous membrane becomes at one time red and dry, showing that its circulation is disturbed, and its secretions are perverted or suppressed; at other times pale and moist, and loses its smooth healthy appearance; the secretions become vitiated, much diminished, or entirely suppressed; the gastric fluid very scanty; the mucous coat scarcely perceptible; and the follicles flat and flaccid, with secretions insufficient to protect the orifices of the *tubuli*, and the cells from irritation.

The inner coat of the stomach in the same state sometimes presents eruptions of deep-red pimples, not numerous, but scattered here and there over the villous membrane, and rising above the surface of the mucous coat. At their first appearance, these are red and sharp-pointed, but frequently become filled with purulent matter. At other times the internal coat presents irregular, circumscribed red patches of *erythema*, varying in extent from half an inch to an inch and a half in circumference. These must be regarded as the effects of congestion in the minute blood-vessels of the stomach. Connected with these red patches are sometimes observed small apthous crusts; and occasionally abrasion of the lining membrane, like the rolling up of the mucous coat into shreds or strings.

The appearances now enumerated, when slight, do not uniformly affect the functions of the organ so much, as to give rise to manifest and unequivocal external symptoms. When considerable, however, and particularly when there are corresponding symptoms of disorder, as dryness of the mouth, furring of the tongue, thirst, quick pulse, and dry skin, no gastric fluid can be obtained, not even on the application of the alimentary stimulus. Drinks received are immediately absorbed or disappear. Food taken in this condition remains unchanged for twenty-four or forty-eight hours, or more, increasing the disorder both

of the stomach and the whole alimentary canal, and aggravating the general symptoms of disorder, as thirst, furred tongue, heat, and general uneasiness.

The reason of all this disorder is, that gastric fluid is not secreted, in consequence of some change in the state of the *tubuli*, and their nutrient vessels.

5. Changes in the state of the duodenal mucous membrane. The remote situation of the duodenum prevents us from knowing much of that part of the process of digestion which is carried on within its cavity.* There is no doubt, however, that a most important part of the process takes place at this part of the alimentary canal; and it is equally certain, that, if its mucous membrane be affected with congestion, injection, inflammation, catarrh, or other disorders, or if much viscid mucus be poured out, these circumstances must modify considerably, and in all probability disturb the natural course of that part of the alimentary function which consists in the formation of chyle, and its due separation from the excrementitious part of the alimentary matters. Dr Yeats makes it appear probable that imperfect digestion in this bowel will be attended with more conspicuous bad effects than in any other part of the whole intestinal tract.

The duodenal mucous membrane is liable to suffer much both from improper articles of food and drink, but especially the latter. The habitual and continued use of spirituous liquors, especially, is known to induce in it a state of vascular congestion and irritation, which, though at first temporary and slight, becomes at length permanent and severe. The glands or follicles of Brunner become enlarged and hardened; the whole membrane becomes thick, firm, irregular, and friable; and the bowel, which is important as an auxiliary stomach, (*ventriculus succenturiatus*,) becomes quite unfit to discharge its functions.

It may not be altogether easy to say, whether this morbid state of the duodenum depends on the introduction of undigested masses of food, prematurely impelled into the bowel, or the irritation of the ardent spirits. One of the effects of the latter is to coagulate all the albuminous articles of food, and to indurate the fibrinous articles of food, and thereby to render them both more indigestible, so that they must be conveyed into the *duodenum* in a very imperfectly dissolved state. But the fact is certain,

* Some Observations on the Duodenum, &c. By G. D. Yeats, M.D. F.R.S. &c. Medical Transactions, Vol. vi. p. 325. London, 1820.

that, in spirit-drinkers, the duodenum becomes thickened, indurated, and unusually vascular, and eventually lacerable.

6. Changes in the state of the biliary secretion. This secretion is liable to be influenced, 1. by peculiar states of the capillary system of the hepatic arteries; 2. by peculiar states of the capillary system of the portal veins; and, 3. by peculiar states of the excreting ducts.

The capillary system of the hepatic artery anastomoses so freely with that of the portal veins, that it is impossible, in reasoning on the secretion of the liver, to separate the one from the other, or draw any distinction between the different states incident to each. The origin and distribution of the portal veins, however, is such, that states of the intestinal mucous membrane or of its contents, must have some, perhaps considerable, influence on the blood flowing through them into the liver. The situation of these vessels between the intestines on the one hand, and the liver on the other, establish a close and intimate connection between the two, so that the condition of the one must depend very much on that of the other. The experiments of Tiedemann and Gmelin, of Mayer, and of Magendie, show that the venous *radiculae*, which arise from the *ileum*, absorb with great facility almost all substances which are applied to its mucous membrane. It follows, therefore, that the blood in the portal veins must be modified by the nature of the intestinal contents; and in all probability the secretion of bile may be influenced by the same cause. It is difficult to point out the precise changes which may result in every given case; but it may be reasonably inferred that changes must take place. It is easy to see that the circulation of the portal system will differ very much in a constipated state of the intestinal tube, and when that tube is regularly and duly emptied of its excrementitious matter.

The excretory ducts are liable to inflammation, producing contraction of their calibre, and obstruction of their canal, to obstruction from viscid mucus or concretions, to pain from distension, and, it is supposed, to spasm. In either case the biliary fluid is prevented from reaching the duodenum; and the usual phenomena of disturbed digestion, with more or less epigastric pain, and sometimes jaundice, follow.

7. Changes in the state of the pancreatic secretion. Little is known of this secretion in the healthy state, and much less

of its influence when disordered, suspended, or suppressed. But as it appears to be necessary to the process of the formation of chyme, it is reasonable to presume, that, if diseased, it must cause some disorder in the course of the digestive process.

8. Changes in the state of the intestinal mucous membrane, and changes in the state of its muscular tissue. The intestinal mucous surface, like others of the same kind, is liable to congestion, injection, inflammation, catarrh, disordered secretion, and other disorders. Little, however, is known with certainty on their nature or their influence over the process. One thing is matter of observation, and is easily understood. When the excrementitious matter is too long detained in the canal, not only does it cause a mechanical distension, which diminishes the contractile power of the intestinal canal, but it deranges the capillary circulation, and disturbs the proper secretions of the membrane. This is the state which has been so much spoken of by Dr Hamilton* and Mr Abernethy, (p. 43), as denoting torpor or insensibility of the intestinal canal. If there is a peculiar intestinal fluid (*Succus intestinalis*) necessary for some of the purposes of digestion, as maintained by Haller, and more recently admitted by Abernethy, (p. 27), and Magendie, there is little doubt that alterations may also take place in it from the same or similar causes, and may indirectly contribute to derange the process of alimentation. It is highly probable that the unusually long delay of excrementitious matter, which ought to be expelled, effects so great a change in the mucous surface of the intestinal canal, that the secretion both of mucus and of proper intestinal fluid is much changed.

These remarks apply also to the great intestines, and the lower extremity of the intestinal canal. It appears both from anatomical examination, and likewise from observation of the living body in the case of animals and fistulous openings of the intestines, that if the excrementitious matter is not confined exactly and exclusively to this division of the tube, it is at least principally and chiefly in it, that the excrementitious remains of the food are deposited, till the due season arrives for their periodical discharge. Everything that is hitherto known regarding this function shows that the regular discharge of excrementitious matter, in a form neither so fluid as to be frequent, nor so

* Observations on the utility and administration of Purgative Medicines, by James Hamilton, M. D. Edin. 1823, chap. ii. and vi.

solid as to be painful and rare, is indispensable to the healthy state of this part of the tube and of the whole canal. When delayed too long, the fluid part is converted into gaseous substance, which escapes in the usual mode from time to time; but as the solid is incessantly augmented by fresh additions from the upper part from the canal, it is accumulated to such extent as to distend considerably the lower part of the colon, and in this manner to impair its sensibility and diminish its contractile powers, and finally to disorder its secretions. To such an extremity does this loss of sensibility and contractile power proceed, that in some instances the discharge, which ought to take place at least every day, does not take place in less than a week, or even ten days, or two weeks. These extreme instances of constipation are attended, it will appear, with very bad effects both on the process of digestion, and on the general health.

It may not be improper to remark in this place, that there is in the relative disposition of two parts of the intestinal tube, a peculiar arrangement to maintain connection or correspondence in action, and to obviate in some degree the tendency to induce delay of excrementitious matter in the cavity of the canal. The transverse arch of the colon is firmly applied to the great arch or curvature of the stomach by means of the omentum, in such manner, that every motion of the latter is attended with more or less motion in the former. Thus when the stomach becomes distended with food, its great curvature is carried forwards and upwards, and forms a more complete arch. The omentum, which is attached to it, and the transverse arch of the colon are also elevated and carried forward; and, as the distension goes on, the colon is somewhat compressed. Its peristaltic motion is thereby excited, and probably its circulation is somewhat influenced; but at all events, its contents are propelled forward toward the sigmoid flexure. If it is much distended, if its sensibility and contractile powers are not impaired, these peristaltic motions may be propagated along the whole course of the colon, until the rectum is thrown into action; and the contents of the lower part may be expelled. It is in this manner that, in cases of diarrhoea and dysentery, when the sensibility of the colon is morbidly increased, the introduction of food or drink into the stomach is speedily followed by the discharge of part of the contents of the great intestine. The motion is not propagated, as has been thought, along the whole canal, but only from the

transverse arch of the colon, along its sigmoid flexure to the rectum. In this manner, also, in many persons of delicate and sensible intestines, the alvine evacuation takes place regularly after the same meal daily.

The proximity of the *duodenum* to the transverse arch of the colon suggests similar inferences. *

The accessory agents of digestion are, 1. the temperature of the viscera; 2. the motion which they receive from the alternate action of the diaphragm and abdominal muscles; 3. the compression to which the divisions of the intestinal canal undergo from the diaphragm on the one hand, and the abdominal muscles on the other; and 4. the nature of the alimentary matters which are submitted to the action of the organs concerned in digestion.

1. From the experiments of Dr Beaumont, it appears that the temperature of the human stomach is not at all times the same. In the case of St Martin, it was found to vary from 98° and 99° to 101° and 102°, (p. 209, Exp. 59), which is the highest rate that it attained. The ordinary temperature of the healthy stomach may be estimated at 100° Fahr. In general the temperature is higher at the pyloric than at the splenic end (Exp. 75 and 79); it is also increased on taking exercise. (Exp. 26, 83, and fourth series of exp.)

What are the causes of this increase in temperature? Dr Beaumont thinks it probable that it depends on variations in the atmosphere, a dry atmosphere increasing and a humid atmosphere diminishing, the temperature of the stomach. In one or two experiments it appeared that the heat was increased during the active period of digestion; but this result was not observed in other cases.

The temperature of the intestinal canal is not liable to vary much; and it is, therefore, superfluous to speak of any influence exercised by this circumstance in the process of digestion.

2. and 3. It is different, however, with regard both to the occasional compression and the motion communicated by the alternate action of the diaphragm and abdominal muscles. The descent of the diaphragm during inspiration forces the whole movable contents of the abdomen before it; and upon its ascent for the purpose of expiration, the contraction of the abdominal muscles carries them in like manner upwards. During great

* Some observations on the Duodenum, &c. by G. D. Yeats, M. D. &c., Medical Transactions, Vol. vi. p. 329 and 330.

muscular efforts also, when it is requisite to fix the chest, by shutting the *glottis* and keeping the diaphragm immovable, the abdominal muscles are made to contract powerfully against it to prevent it from descending further; and during this contraction the whole contents of the belly undergo a great degree of compression. Both actions now described have the effect of compressing the bowels, rousing their peristaltic action, and propelling forward their contents towards the colon and rectum. This is one of the modes in which corporeal exercise proves beneficial. Respiration is performed more fully and more frequently in a given time, than during the state of rest; and the intestinal canal is, therefore, subjected to more thorough motion, and perhaps to more complete and more frequent occasional compression. Hence, also, may be understood the bad effects of inactivity and sedentary habits.

4. *The nature of the alimentary matters submitted to the action of the digestive organs* forms a most extensive subject, and would require me to consider the influence of all the articles employed as food or drink, and to give a dissertation on diet and regimen. This would much exceed the limits within which these observations must be restricted. I shall merely say, therefore, that alimentary articles may be injurious in two modes, *a.* either by being excessive in quantity, or *b.* by being improper in quality.

a. When food is excessive in quantity, whether it consist of one or several alimentary articles, its presence is followed by an uneasy sense of fulness and distension, not unfrequently amounting to pain. If the epigastric region be pressed, it bears pressure badly, and is sometimes very uneasy. The respiration is also more or less impeded. The diaphragm is not permitted to descend very freely or to its usual extent; and sometimes the alternate motions of the diaphragm and abdominal muscles are attended with so much pain, that the motions become short and limited and more frequent in a given time than natural.

After excessive eating or drinking chymification is retarded and sometimes interrupted. Not only do the alimentary matters act by overdistension in irritating the gastric mucous membrane and its vessels, but the excessive quantity of food being more than the proportion of gastric liquor secreted during the time of each meal, or soon after it, can easily transform into chyme, it irritates instead of nourishing, causes fermentation and

the generation of acid, and is often either brought upwards by vomiting, or is carried into the duodenum in a state of incomplete digestion such, that it produces there a second series of irritations, and causes either extrication of air with colic pains or diarrhoea, or some similar derangement in the intestinal tube.

Dr Beaumont ascertained that in St Martin after excessive eating or drinking, not only was chymification retarded, but the fluids became acrid and sharp, excoriating the edges of the aperture into the stomach, and invariably caused the appearance of the aphthous patches and other indications already mentioned of the diseased state of the gastric villous membrane. Under the same circumstances, also, vitiated bile is found in the stomach, and flocculi of mucus become much more abundant than in health. These facts show that not only does excess cause regurgitation of bile from the duodenum into the stomach, but also a sort of catarrhal disorder of the gastric mucous membrane.

b. Alimentary articles may be improper in quality.

The modes in which food may be improper in quality are numerous. Many articles used as food are more indigestible than others. Thus, it may be considered as an established rule, that all vegetable and animal matters are much more easily acted on by the gastric fluid, and with less irritation to the organ, when boiled, than when raw. This was proved by the experiments of Spallanzani and Steven, and also by those of Dr Beaumont, (Exp. 95.) In some instances, as in the case of oysters, the articles seem to be more speedily chymified when raw than when roasted, broiled, or stewed, (Beaumont, Table, p. 292;) and in others, as in the case of recently salted pork, there appears to be no difference. Then various alimentary articles are more easily chymified than others. In general vegetable articles disappear from the stomach, or are transformed into chyme in a shorter time than animal matters; but they sometimes cause, if in large quantity, fermentation and acidity. Animal matters, on the other hand, are longer in being thoroughly transformed; but, in small quantity, they are less liable to produce acidity, and give rise to symptoms of flatulence. From the tables, given by Dr Beaumont, which are constructed from his experiments, it appears that boiled rice, boiled pigs' feet, and boiled tripe are the articles most rapidly digested, each of them being dissolved in the course of a single hour; that such substances as sago, tapioca, and barley, take longer time in being transformed, the first oc-

cupying one hour and three quarters, and the other two, each two hours ; that baked corn bread, that is, I presume, oat bread, occupied three hours and a quarter, and baked wheat bread took three hours and a half in transformation ; while beef, pork, and mutton, dressed in the simplest way, all take about three hours. The kind of animal matter which Dr Beaumont found to be most rapidly and easily transformed in the stomach of St Martin, was boiled venison steak, which took only one hour and thirty-five minutes, (Exp. 29.)

The following articles take four hours in being converted into chyme ; viz. salted salmon, boiled ; fried beef ; boiled veal ; boiled or roasted domestic fowls ; roasted domestic ducks ; boiled soup, beef and vegetables, with bread ; and fried heart. The following articles occupied four hours and a half in undergoing chymification ; viz. recently salted pork, boiled ; fried veal ; roasted wild duck ; and mutton suet ; and roasted pork, boiled tendon, and boiled beef suet took between five hours and a quarter, and five hours and a half.

Various articles of food are known by observation to be much more indigestible than others, and consequently give rise in the course of chymification to more gastric irritation and some disorder in the process than other articles. Thus, though the experiments of Sir Astley Cooper* agree with common observation in showing that the flesh of the cod, and consequently most white fish, is easily digested, yet it is well known that salmon, mackerel, trout, herring, and all the fishes with reddish flesh are not very easily digestible, and not only take a long time in undergoing the chymifying changes, but are liable to produce symptoms of acidity, heartburn, and colic pains, and sometimes diarrhoea. Hence these fishes should be eaten as articles of food in moderation, and not very frequently.

All articles of pastry are liable to be very slowly digested, and in the course of the process, to give rise to more or less irritation of the gastric mucous membrane and *tubuli*.

Of articles used as drink which are improper, there are many which are in several respects highly injurious. But it may be sufficient to advert to the effects of ardent spirits ; an article so frequently used, that it may be said to be more or less efficient in inducing symptoms of gastric disorder in almost every disease, to which the human frame is liable.

* *Apud* Dr Scudamore's Treatise on the Nature and Cure of Gout, p. 632.

When ardent spirits are introduced into the stomach, their first effect is to excite the mucous membrane and its vessels, constricting the latter, and retarding in them the motion of the blood, so as to cause instantaneous, though partial and temporary, congestion. If food be contained in the stomach at the time, they coagulate the albuminous articles, and indurate all the fibrinous and amylaceous articles. This coagulation, however, is not like that of the gastric juice, which solidifies the fluid albuminous alimentary articles, in order to act more readily on them afterwards; but it renders these coagulated and indurated articles much less susceptible of the action of the gastric fluid than before. The two effects now specified are such as to interrupt and retard the process of digestion, leaving various alimentary articles more or less imperfectly acted on in the stomach, or allowing them to be propelled in a crude and half-dissolved state into the duodenum, while the mucous membrane and the gastric capillaries, by being thus unnaturally excited and irritated, become afterwards enfeebled, and fall into a state of real atony.

The repetition of this sort of stimulation, and its continuance for some time, is further productive of more serious injury to the mucous membrane of the stomach. Dr Beaumont ascertained by direct inspection of the stomach of Alexis St Martin, upon one occasion when he had been drinking ardent spirits pretty freely for eight or ten days, (28th July 1833), that though he complained of no pain, nor showed symptoms of any general indisposition, and represented himself to feel well, and to have good appetite, yet, at this very time, after this course of unnatural and poisonous excitement, the stomach, though empty, was not in a healthy state, but that its villous membrane was dry and red, or presented some *erythema*, and aphthous patches on its inner surface. These morbid appearances in the gastric villous membrane continued and increased for several days. On the fourth day after, when it was again inspected, there was considerable *erythema* of the inner membrane, and some aphthous patches on the exposed mucous surface; and at the same time, the gastric juice, instead of being clear or pure as in health, was turbid and viscid, being mixed apparently with morbid mucus. On the following day, viz. the 2d of August, bile was found in the stomach tinged with blood, which appeared to exude from the surface of the *erythema*, and the aphthous patches were ten-

der and irritable; yet St Martin complained of no pain, indisposition, or even impaired appetite. On the following day, 3d of August, however, the erythematous appearance was more extensive, and the spots were more livid, and showed a disposition to effuse drops of blood; the aphthous patches were larger and more numerous; and the gastric fluid was mixed with a large proportion of thick ropy mucus and muco-purulent matter, slightly tinged with blood. Though at this time it is stated that St Martin complained of no symptoms indicating any general derangement in the system, and manifested no very essential aberration in the functions of the stomach, but had good appetite and slept well; yet it is added, that he complained of an uneasy sensation and tenderness at the pit of the stomach, and some giddiness, with dimness and yellowness of vision in stooping and again rising, that his countenance was rather sallow, and his tongue was covered with a yellowish-brown coat. The same tendency to bleed from the gastric villous membrane, with an alkaline state of the gastric fluid, continued on the 4th, but began to disappear on the 5th of August, and was gone on the 6th, leaving the coats clear and healthy, and rendering the gastric fluid again clear and acid as in health.

It is important to remark, that, during the latter days of this state, St Martin was confined to low diet, and the use of diluent fluids, and was not allowed to taste any stimulating liquors, or to indulge in excesses of any kind.

In these morbid changes in the state of the stomach, two circumstances are very clearly established. The first is the cause or causes producing them; and the second is the effect which they produce on the functions of the stomach, and the system at large.

The facts ascertained by Dr Beaumont prove beyond the possibility of question or doubt, the pernicious influence of the continued, repeated, or considerable use of spirituous liquors, on the gastric villous membrane. They evidently render it red, dry, and bloodshot; then, by increasing this congestion, they cause the membrane to effuse blood; and in consequence of placing the membrane in this state, they suspend entirely the secretion of gastric fluid, and consequently interrupt and retard digestion.

The same effects, though slighter in degree, result from the use of vinous liquors, diluted spirits, and even the stronger fermented liquors. It is erroneously supposed, that, because wine

or strong beer must be taken in greater quantity to produce the same degree of intoxication than ardent spirits, the former are less injurious, and may be taken to greater extent and more freely, with impunity than the latter. The stimulus and irritation, though differing in degree, are the same in ultimate effect; and their operation is further aided by the tendency which they possess to produce acidity within the stomach, and thus add a new and additional source of gastric and gastro-intestinal irritation. A very bad effect, which is the offspring of this pernicious delusion, is the fancy, that an increased quantity of wine or fermented liquor is allowable; and in general by this indulgence, quantities so large are taken, as to produce the same consequences, physiological and pathological, which ensue from the liberal and habitual use of spirits.

As the same states of the gastric villous membrane ensue from excess in eating, from eating improper or indigestible articles, and from swallowing food without due mastication, or slow and deliberate mastication, it is easy to understand the nature and operation of these circumstances, as gastric irritants and causes of dyspeptic disorder.

A peculiar circumstance deserving attention here is the fact, that these changes in the gastric mucous membrane may proceed to a considerable extent without giving rise to marked or urgent external symptoms, either of general or gastric disorder. However singular this may appear, it was established by the observations of Dr Beaumont in the case of Alexis St Martin. It is very true, that Dr Beaumont seems to overlook various slight symptoms, as not of sufficient moment to deserve especial attention; for instance, the tongue being furred, the countenance being sallow and dingy, and the patient complaining of some headach and dimness of vision. The truth appears to be that, if this disorder be slight and temporary, the symptoms are also slight and temporary, and do not attract attention. But if the morbid state of the stomach be permanent, it causes not only furred tongue, hot dry mouth, bitter taste in the mouth, thirst, and other uneasy symptoms, but *anorexia*, giddiness, headach, languour and general feebleness. The dry red state of the stomach requires to continue, in short, for several days before it produces evident external symptoms.

Moral Affections.—The effect of these has been long noticed. Grief, solicitude, mental distress, continued mental exertion,

and even anger produce remarkable effects in impairing the appetite and disordering the secretion of the gastric mucous membrane. A singular effect of anger was observed by Dr Beaumont in the case of Alexis St Martin. He observed several times, not only that fear and anger suspend the secretion of gastric fluid, but that, during a fit of anger, bile was observed to flow into the stomach. This is not natural, and it must be the effect of the mental disorder upon the biliary secretion and the duodenum. If this fact be ascertained to be constant, it illustrates the notions of the ancients, who denominated an angry man choleric, and who often applied the term bile or gall, to wrath or anger. My limits do not allow me to dwell on this part of the subject, and I must restrict myself to its mere mention.

§. I. Indigestion. *Dyspepsia* ; *Gastria*.

Observations on the Nature, Causes, and Cure of those Disorders which are commonly called Nervous, Hypochondriacal, or Hysterical. By Robert Whytt, M. D. Edinburgh, 1764, 1765, 1767.—Remarks on the Complaint commonly known under the name of Sick Headach. By John Fothergill, M. D. &c. Medical Observations and Inquiries, Vol. vi. p. 103, and in Works of John Fothergill, edited by Lettsom. London, 1784, p. 597.—Some Remarks on the effects of *Lignum Quassiae Amarae*. By John Coakley Lettsom, M. D. &c. Memoirs of the Medical Society, Vol. i. p. 128. London, 1789.—On the Constitutional Origin of Local Diseases. By John Abernethy, F. R. S. &c. London, 1809, and in Surgical Works. London, 1811. Vol. i. p. 1.—A Practical Treatise on the Diseases of the Stomach ; and of Digestion, &c. By Arthur Daniel Stone, M. D. &c. London, 1806.—Reports on the Diseases in London. By Robert Willan, M. D. in Miscellaneous Works, p. 119.—Asthenia, p. 170, &c. London, 1821.—Observations on the Utility and Administration of Purgative Medicines in several Diseases. By James Hamilton, M. D. Seventh Edition, Edinburgh, 1823. Chapters ii. vi. and vii.—Of Headaches which arise from a defective action of the Digestive Organs. By Pelham Warren, M. D. &c. Medical Transactions, Vol. iv. London, 1813, p. 233.—A Treatise on Indigestion and its consequences, called Nervous and Bilious Complaints, with observations on the organic diseases in which they sometimes terminate. By A. P. Wilson Philip, M. D. &c. &c. London, 1821.—Practical Remarks on Indigestion, as connected with Bilious and Nervous Affections of the Head and other parts, &c. &c. By John Howship, Assistant-Surgeon to St George's Infirmary. London, 1825.—An Essay on Morbid Sensibility of the Stomach and Bowels, as the Proximate Cause or Characteristic Condition of Indigestion, Nervous Irritability, Mental Despondency, &c. By James Johnson, M. D. London, 1827. 8vo, pp. 128.—The Stomach in its Morbid States, &c. By Langston Parker, M. R. C. Surgeons. London and Birmingham, 1838. 8vo, pp. 303.

INDIGESTION, or the disease termed by physicians *Dyspepsia*, appears under various forms, and gives rise to various effects in different persons, and sometimes even in the same individual at different times. Thus suspension or interruption of the process

of digestion may give rise not only to symptoms and sensations which have their seat in the stomach, duodenum, or other parts of the alimentary canal,—but to morbid phenomena occurring in the head, in the chest, in the secreting processes, either in the skin or kidneys, and to morbid phenomena occurring in those organs which are concerned in sensation and locomotion.

This natural complication of the subject renders it difficult to give a correct delineation of the characters of the disease taken in general, or of the various shades which it may assume. According to the distinctions, however, which have been laid down above, I shall consider the disease, first, in its primary or proper gastric form, secondly, in its remote effects. As a generic and comprehensive appellation, I shall employ the term *Gastria* to signify every form of derangement to which the process of digestion is liable. It would be easy in a disease so liable to variation to subdivide this into many species or varieties. But as this refinement would not tend neither to improve our pathology or render our practice more efficacious, we propose at present to make no more than four varieties of the disease;—*Gastria simplex*, ordinary indigestion; *Gastria Pyrosis*, the water-brash; *Gastria asthenia*, chronic or nervous weakness; and *Gastria Chlorosis*, or Green-sickness.

Gastria simplex, the *Dyspepsia* of Cullen, is the simplest form of the disease. Its principal symptoms are want of appetite, or even loathing of food, occasionally variability of appetite, squeamishness, sudden and transient distensions of the epigastric region, referred to the stomach, occasional eructations, sometimes of a hot and disagreeable vapour, pains fixed or movable in the region of the stomach, and more or less sensation of burning heat. At the same time the belly is either very slow and irregular, or much bound; the tongue is covered with a viscid fur, especially in the morning; there is a bad, bitter, sometimes a metallic taste in the mouth; the breath is foul, and may be hot to the sense of the patient; the lips and gums are the seat of an uneasy sense of dry and clammy heat, especially after exercise, or in the morning; the skin is hot and dry; the palms of the hands are often the seat of a peculiar arid or tingling sense of heat. The urine is either thin and pale, or high-coloured, and deposits a cloudy sediment, according as fluids have or have not been recently drunk.

Vomiting is mentioned by most authors as a symptom of the

simple form of indigestion. But it is by no means constant, and in many of the best marked and most severe cases of the disease, it is entirely wanting. There are instances, however, in which many articles of food are rejected in the course of half an hour or an hour after they have been taken; and this is particularly the case if malt liquor is one of them. In other instances, again, without squeamishness, and the peculiar motion of vomiting, the food is brought up by a sort of involuntary rumination in separate mouthfuls shortly after it has been swallowed. In some cases, much viscid mucus is discharged from the stomach, either by vomiting or by rumination. These occur chiefly in females, and in delicate persons of the male sex.

The pains referred to the region of the stomach are various. They may be dull and heavy like stomach-ach, (*Gastrodynia*); they may be gnawing, and accompanied with faintness, and a spurious and unnatural desire for food (*Bulimia*); or they may be accompanied with a sense of heat or burning in the organ, when they are known by the name of heartburn (*Cardialgia*.) Occasional hiccup is not uncommon.

These sensations are generally ascribed to the presence of a morbid acid, the result of imperfect digestion.* In other instances, the pain of the epigastric region is so considerable that the surface becomes tender, and cannot bear pressure without causing uneasiness.

Pains of various kinds are also felt in the bowels. Most commonly they are dull and gnawing, (*enterodynia*); but in some instances, they are more acute, like ordinary tormina, and sometimes terminate in diarrhoea. In many cases, they are manifestly the effect of wind pent up in the bowels.

The pulse is very rarely affected. But it sometimes happens that the sense of distension in the stomach becomes so considerable as to impede the free exercise of respiration.

These symptoms, which are undoubtedly to be ascribed to imperfect digestion of the food in the stomach, and perhaps duodenum, are, in some instances, attended or alternated with more or less headach and distension of the temples; giddiness, and general languor. These complaints, however, are not constant; and as cases of dyspepsia, such as we describe, may occur with-

* "But the acid occasions various disorders, as flatulency, eructation, heartburn, gnawing pains of the stomach, irregular appetites and cravings, looseness, griping, emaciation, and debility."—Cullen, (1205).

out them, I shall defer their further consideration till another time.

Dyspepsia may be idiopathic or symptomatic. The idiopathic form affects chiefly the young of both sexes, from the age of puberty to thirty-five or forty, after which, however severe it may have been in early life, it undergoes a spontaneous cure. In females, it is invariably aggravated during pregnancy, and sometimes at the menstrual periods.

By Cullen the proximate cause of dyspepsia was thought to be weakened action of the muscular fibres of the stomach, together with some altered state of the gastric fluid. It may perhaps be admitted that, in most cases, the muscular fibres do undergo some diminution of power or contractility; but this is neither the sole nor the principal cause of the dyspeptic symptoms. It is much more likely that the vascular system of the stomach is the principal agent in producing the phenomena. The remote causes and several of the symptoms would lead to the conclusion, that some change takes place in the capillaries of the mucous membrane, in consequence of which they secrete viscid mucous or phlegm in unusual quantity, together with a vitiated gastric fluid. (Whytt's Works, p. 572.) This change is not inflammation; for it would prove much more serious if it were so, and would cause the usual symptoms; but it appears to be allied to the congested state of the vascular system which gives rise to catarrhal symptoms in mucous membranes generally. It is probable that the same change takes place in the capillaries of the duodenal and iliac mucous membranes. At the same time a degree of chronic inflammation seems in some instances to take place; and this I conceive to be the case in those examples of the disease in which there is tenderness of the epigastric region.

The remote causes of indigestion are pretty well known. At least it is generally possible to trace the disease to some circumstance or circumstances, in the habits of the patient, quite sufficient to account for its formation. In general it may be said, that every thing which has the effect of interrupting the process of digestion, or retarding the motion of the intestinal canal, will act as a remote cause. And of this description, sedentary and inactive habits, more especially if combined with intense study or close application to business, will occur to every one, as sufficiently powerful and very general causes of dyspeptic complaints. It is thus that they are almost the invariable lot of the

studious, the literary, and the official; that they are often found in the sedentary artisan and the industrious mechanic; and that the young of both sexes, either occupied in education, or in business, seldom escape them entirely.

Another set of causes which are competent, even without the aid of very sedentary habits, to produce dyspeptic, or, as they are often termed, bilious symptoms, is found in the injury done to the functions of the alimentary canal by the habits either of intemperance, irregularity, of fashion, or of business. The powers of the stomach and duodenum may be impaired either by the excessive quantity or the improper quality of food and drink, or by the irregular and unseasonable hours at which it is taken. An unusual load of food mechanically distends the organ beyond its just powers, causes an unnatural and violent action of its vascular and secreting system, and, by providing a greater proportion of alimentary materials at one meal than can be converted in a given time, into nutriment, weakens the natural force, and deranges the natural actions of the organ.

The quality of food is too extensive a subject to be considered at much length here. It is sufficient to say, that while few articles in ordinary use are to be entirely proscribed, yet there are many substances which are much less easily digested than others, and which delicate stomachs cannot take with impunity. Thus butter, rich sauces, pastry, the green fat of turtle-soup, salmon, goose, &c. are highly indigestible.

2. The Water-brash (*Gastria Pyrosis*), was regarded by Cullen as a peculiar affection of the stomach, quite distinct from the ordinary dyspeptic symptoms. For this no good reason can be assigned. It takes place either along with other dyspeptic symptoms, or alternating with them; it is almost invariably produced by the same causes which give rise to the ordinary form of the disease; and the most effectual mode of removing it is by pursuing the treatment which is effectual in removing dyspeptic symptoms.

This disease makes its appearance in fits, which usually come on in the morning and afternoon when the stomach is empty. Its first symptom is a pain at the pit of the stomach, with a sense of constriction, as if the stomach was drawn toward the back by a tight cord. The pain is often severe; and, as it is increased by the erect posture, the body is generally bent forward during its continuance. After some time a thin watery

fluid, sometimes acid, sometimes tasteless, is forcibly squirted up the œsophagus in successive jets and in considerable quantity. These jets are frequently repeated for some time, but are not followed by immediate relief; and it is only after the lapse of a considerable interval, that the painful constriction with which the fit commenced begins to abate and finally to disappear, and with it the eructations of liquor.

Cullen remarked that the fits of water-brash commonly come on without any evident exciting cause. This is very true in many instances; but it is not more wonderful than the approach of many other complaints, which, occurring under the form of fits, appear either spontaneously or on the application of an exceedingly slight and trifling cause. Its occurrence depends on a previous unhealthy state of the stomach, induced either by improper food, or by the use of substances which exercise a deleterious effect. It has been said to be connected with the use of milk and farinaceous food. But it is not necessarily connected with them, unless the grain from which the food has been prepared, is either originally bad, or has become so by mould, mustiness, or other causes of corruption. The disease is very often seen in those whose stomachs have been impaired by the habitual use of spirituous liquors. Cullen states it to be often without any symptoms of dyspepsia. But it will be found, that persons liable to water-brash digest very badly, have almost invariably a bad appetite, constipated bowels, and occasional stomach-ach or heartburn, and are liable to suffer unequivocal dyspeptic symptoms after the use of certain articles of food.

Water-brash, though frequent among the lower orders of the poorer countries of Europe, is sometimes, however, found among those of better condition. Its frequency in Lapland, as reported by Linnæus, is to be ascribed to the bad qualities and the scanty supply of bread and other farinaceous substances. Its occurrence in Holland, where it is now less frequent, depends both on this cause and on the use of spirits. It is said also to take place in several parts of Switzerland, where the inhabitants employ the ground horse-chestnut as bread. It appears generally in persons under middle age, but seldom in those below the age of puberty, and very rarely in advanced life. It affects both sexes, more frequently the female, often pregnant women, and some women only when in that condition. It appears also to affect the unmarried more than the married women, and of the latter most frequently the barren; a circumstance

which is in some sort explained by another fact, that it is not uncommon among women labouring under whites. When it has once taken place, it is ready to recur occasionally for a long time after.

Cullen ascribed water-brash to spasm of the gastric muscular fibres, subsequently communicated to the blood-vessels and exhalants. This notion is perhaps not far from the truth. That there is spasmodic action seems to be established by the peculiar cord-like pain with which the fit commences, and by its coming on in fits or paroxysms as spasmodic actions generally do. But whether this causes the action of the vessels which produces the morbid secretion, is another point altogether. Spasm ought to have the effect of shutting up the vessels and suspending their ordinary secretion. It seems more probable, that the unhealthy action of the vessels is the first process; and that the effusion of the morbid secretion, which results from it, induces the spasmodic and painful action of the muscular fibres, so as to expel the liquor by the forcible and repeated jets which take place. The nature of the fluid is not known. No good analysis of it has been yet communicated.

3. *Gastria Asthenia*, Chronic Weakness. (*Atrophia Nervea* of Sauvages, (Nervous Atrophy and *Marasmus* of Whytt.) (*Atrophia debiliūm* of Cullen.) This form of dyspeptic disorder is noticed chiefly for the sake of referring to it a set of anomalous complaints very frequently observed in the inhabitants of crowded towns, and ill-aired abodes, which was described long ago by Whytt, under the name of *Marasmus* or Nervous Atrophy, (Whytt's Works, p. 598,) and which has been particularly described by Willan, as it appears among the confined inhabitants of London during the summer months. It has been recently designated the *Cachexia Londinensis*.

According to the account of this accurate observer, it commences with general languor, sense of lassitude or aching in the limbs; and often with tremors. These symptoms are succeeded by shooting pains, headach, giddiness, and a strong disposition to sleep, even in the day-time. A sensation of faintness or depression is referred to the stomach, which calls for a frequent supply of nourishment; but as this morbid craving is not seconded by proportional activity of the digestive powers, overcharge takes place, and is followed by heartburn, flatulency, pains of the stomach more or less severe, or squeamishness with bilious vomitings and diarrhœa. Females in these circumstan-

ces are distressed with pain in the left side, alternating with the pain of the stomach.

In other instances in which the appetite is extinct, and the stomach loathes all its usual food, there is an apprehension of the stomach being entirely gone; and little complaint is made either of squeamishness, loss of appetite, or the ordinary marks of impaired digestion. The tongue also is clean and even moist, but trembles and quivers when put out. The bowels are generally slow, and sometimes so obstinately bound, that a stool never takes place without the use of medicine. The skin is dry and cold during the day, but becomes irregularly and disagreeably hot during night, so as to prevent sleep, and it is only towards morning, when a broken and unrefreshing slumber steals on, that the skin becomes moist, and some partial sweating appears about the head, neck, and trunk. In some instances the night sleep is interrupted by frightful dreams and startings; and the patient wakes in the morning with a sense of bruising and fatigue in the limbs.

The pulse is weak and languid; but not much more frequent than natural. It is, however, liable to be readily and speedily accelerated; a circumstance which explains what Willan asserts, contrary to our experience, that the pulse is usually frequent in persons of the sanguine temperament. This acceleration is merely temporary; for if the patient be allowed to collect himself, the pulse will be found nearly natural, and very rarely above 80 in the minute. The general strength is always much impaired; and though the limbs are not much extenuated, the patient is weak, listless, averse to effort, and unable for much corporeal exertion. The countenance is generally pale, and of a dingy hue, and expressive of much weakness and anxiety. The temper becomes fretful, peevish, and capricious; the judgment defective and irresolute; the mind incapable of attention or effort; and the imagination suggests nothing but gloomy ideas.

The corporeal symptoms of this disorder depend on imperfect digestion, a languid and deranged state of the circulation of the gastro-enteric mucous membrane, and the languor which arises from imperfect nutrition. The functions of the skin and of the secreting organs in general are also much disordered, in consequence of the intimate relation subsisting between them and the gastro-enteric mucous membrane.

The external causes of asthenia are impure air, sedentary

occupations, and the irregular modes of living incidental to the inhabitants of towns. But in addition to these, it is often the direct result of mental anxiety, distress, despondency, or disappointment. In other instances, it appears to arise from the monotony of the dull, unvaried tract of existence, which is so frequently pursued by the inmates of cities. It affects subjects of all ages after puberty; but is perhaps more frequently seen in persons above thirty than under. It affects both sexes, but perhaps men more frequently than women; and it appears not to occur more frequently among the rich and affluent, than among the middling classes, and the inferior and indigent. It affects not only the studious and the literary; but many of those engaged in occupations which are carried on within doors, in class rooms or crowded apartments. It appears, for example, among clerks and others much engaged at the desk; among those engaged in printing-offices; in manufactories, and in ware-rooms; among milliners, dress-makers, and others much engaged in the sedentary occupations of sewing, knitting, weaving, &c.

4. *Gastria Marasmus*.—In infants and children brought up in towns and situations, where they are excluded from fresh air and exercise, we not unfrequently meet with a species of bad health and pining sickliness, which has been traced by Dr Hamilton to a torpid or weakened action of the alimentary canal.*

This disease, which is described by the ingenious author under the general, but appropriate, name of *Marasmus*, begins with depraved or lost appetite; pale dingy colour of the countenance; flabbiness of the features; fetid breath; swelling of the upper lip; and itching and picking of the nose. At the same time, the belly is observed to be swollen and distended; it is painful in certain points when pressed, and emits a sound in some parts dull, in others more clear. In general, along the tract of the colon the sound is dull. The bowels are almost invariably obstinately bound, sometimes irregular; the colour and appearance of the excrements are changed; the skin is dry and pasty; the muscles are flabby, and begin to waste; and the child is sluggish and easily fatigued.

When these symptoms have continued for some time, they are followed by alternate paleness and flushing of the countenance, heat and dryness of skin, feeble and quick pulse, thirst, fretfulness, increasing debility, and disturbed sleep, during which

* Observations on the Utility and Administration of Purgative Medicines, by James Hamilton, M. D. &c. Chapter vi. p. 68. 7th edition. Edinburgh, 1823.

the patients grind or gnash their teeth, are subject to involuntary starting and twitching of different muscles, and are sometimes awakened in a fit of violent spectral delirium.

The degree and number of these symptoms may vary in different cases; but, in general, more or fewer of them are present in every instance of the disease. In some cases, the first set of symptoms continues a long time, without seeming to induce the second. In other instances, the second set of symptoms comes on suddenly without seeming to be preceded by the first.

These symptoms have been generally supposed to depend on the presence of worms in the intestinal canal. It is certainly not impossible for worms to be the occasional cause of them; but it is even ascertained that they appear in their most conspicuous and exquisite form where no worms can be discovered; and disappear under proper treatment where no worms have been expelled. It is also known that worms not unfrequently exist in the intestinal tube without giving rise to any of the symptoms above enumerated, and certainly without producing the impaired appetite, swelled belly, loss of flesh and strength, and general pining appearance which distinguish this disorder.

Dr Hamilton proved satisfactorily that the complaint arose in every instance from a torpid or insensible state and weakened action of the alimentary canal. The costiveness and accumulation of feculent matter, which, if not an effect, is at least an unequivocal proof of this torpor and impaired action, is followed by derangement of the circulation and secretion of the intestinal mucous membrane, defective nutrition, and at length disturbance in the general circulation, with symptoms of irritation and congestion in the cerebro-spinal axis and its membranes. It is in this manner that *marasmus* may in different subjects be the precursor or predisponent cause of Water of the Brain, epilepsy, St Vitus's dance, (*Chorea*), (Hamilton, p. 80, 81, and 124), intestinal inflammation, or the infantile remittent fever, spasm of the intestines, inducing intus-susception, chronic inflammation, and mesenteric consumption, (*Tabes mesenterica*), or lastly, a peculiar loss of power in the lower extremities resembling palsy.*

Marasmus appears most commonly among weak and infirm children, whether they are so from original delicacy of constitution or from incidental causes. It prevails much in large and populous cities, where children are deprived of ready access to

* Abernethy on the Constitutional Origin of Local Diseases, p. 96. Cases on Nervous and Muscular Disorders.

exercise in the pure air, and sicken and pine in the nursery ; where they are confined in crowded and airless school-rooms ; or are nursed in the cheerless and filthy abodes, which the working and indigent classes are too often obliged to inhabit in the confined lanes of large and populous towns. Among children occupied in manufactories also, where long confinement in a hot and vitiated atmosphere becomes doubly injurious, in combination with pursuits unsuitable to their tender age, this disease is frequent and pernicious. Irregularity in diet, and improper or innutritious food also operate as exciting causes ; and the disease is said to prevail much in autumn, when children have access to unripe fruit and vegetable articles.

5. Green sickness ; (*Gastria Chlorosis*). The young of either, but particularly of the female sex, are exposed about the age of puberty to a series of complaints, which, though slight in the beginning, become by slow advances abundantly severe and distressing. They are ushered in by a disagreeable exhalation from the mouth, not unfrequently of a feculent odour ; by acid and fetid eructations ; and by loss of appetite, aversion to the wonted food, and a desire for substances not digestible (*Pica*), such as chalk, cinders, sand, &c. These symptoms are preceded by costiveness, which continues throughout the whole course of the disease.

The ruddy complexion at the same time gives place to a pale, dingy, sometimes a greenish or yellowish colour of the skin ; the vermilion colour of the lips and gums is exchanged for a waxy death-like paleness ; the eyes are dull, the orbits become puffy, and are surrounded with a dark leaden-coloured circle. All the motions become feeble and languid ; the pulse, which is generally small and slow, is readily excited to a quick and irregular beat ; palpitation of the heart, and hurried and labouring breathing are induced by slight bodily exertion or mental agitation ; fainting is not unfrequent ; headach, giddiness, dulness, are almost constant ; and the memory and judgment become impaired. A peevish and recluse turn of mind makes the patient shun society, and court darkness and solitude.

In the progress of the disease, the flesh becomes loose and flaccid, the urine is diminished, the perspiration seems to be suspended, and the body pines away. Serous effusion into the cellular membrane produces at first œdema of the lower extremities, and afterwards general dropsy ; and as these symptoms continue or increase, death may ensue,

The train of symptoms now enumerated has been arranged by authors under the different names of Green-sickness (*Chlorosis*), *Leucophlegmatia*, and Cachexy; and various opinions have been at different periods entertained on their pathology.

Cullen, who regarded them as the effect of suppression or retention of the menstrual secretion, ascribes them to the loss of tone resulting to the system from the unhealthy state of the genital organs. This hypothesis, however, is contradicted by many facts. Though green-sickness appears chiefly in girls, it is not confined to them, and may appear also in boys and young men. In many young females the menses are suppressed without any symptoms of chlorosis. In women who have lost an ovary, or in whom it has not been developed, though the sexual peculiarities are indistinct, no green-sickness ensues. It is, in short, much more rational to think that the retention of the menstrual evacuation is the effect, and not the cause of the general languor, especially of the vascular system and the secretions,—which attend this disorder.

A little attention to the origin and progress of the disease shows that, if it do not originate in, it is intimately connected with, a languid and deficient action, and a depraved state of the intestinal canal. Costiveness not only precedes and accompanies all the other symptoms, but is certainly the cause of the feculent odour of the breath, the impaired and depraved appetite, and the disordered state of the function of digestion.

II. THERAPEUTICS.—The treatment of the several forms of indigestion has been rendered unnecessarily complicated in the writings of professional authors. Of many remedies and plans of treatment, few can be said to be invariably and permanently successful in all cases; and though one set of symptoms is relieved by one remedy, and another by something different, the disease remains in a new form; and the patient is teased and distressed between the relief from present evil, and the apprehension of future suffering. The truth is, that medicine is of much less efficacy in the removal than in the relief of dyspeptic symptoms; and more depends upon the resolution, judgment, and regular habits of the patient, than on the skill or resources of the physician.

The tardy and irregular, or languid action of the bowels is, if not a cause, at least a most important part of every form of impaired digestion; and while it continues, it never fails to ag-

gravate all the sufferings of the patient, and to prolong the duration of the disease. The first object, therefore, is to remove constipation, and to render the action of the bowels more regular and more healthy. The dyspeptic should take care that the bowels be emptied duly and regularly every day. It is of little moment what purgative be employed, providing the effect is accomplished, or whether internal medicine be employed at all. Custom and convenience have almost universally sanctioned the use of aloetic medicines; and perhaps there are few instances in which medicines are requisite, where they are quite inadmissible. The fear of inducing piles appear to be either entirely groundless, or much over-rated. It will be found that it is not so much the use of aloetics, as the state of the intestines which demands their use, that brings on hemorrhoidal discharges in persons who employ these medicines.

Aloes are generally given in the form of pill, of which the simplest and most common is the aloetic, consisting of equal parts of soap and aloes. If the opinion of Cullen, that the soap is useless, unless for facilitating mechanical division, be well founded, it might not be an improper innovation to substitute carbonate of ammonia in the proportion of one grain to four of the gum-resin. Where flatulence is a prominent symptom, a more suitable form is supposed to be found in the combination of aloes with assafoetida, (*Pilulæ Aloes et Assafoetidæ*, Edin. Pharmac.) ; two of which, equivalent to ten grains of the mixed medicine, may be given twice daily. For the treatment of dyspeptic symptoms in females, in whom they are not unfrequently combined with disorder of the menstrual function, the combination with myrrh, (*Pilulæ Aloes et Myrrhæ*,) is supposed to be well adapted. Four or six of these may be given daily; in smaller doses, their effect is alterative or laxative. Cullen, however, contended that these additions are frivolous and inert, and that aloes is as effectual when alone, as when given in combination with other medicines. (*Materia Medica*, Vol. ii. p. 527, 528.) The combination of aloes with aromatic substances as in the case of canella, (*Pulvis Aloes cum Canella*, Dublin Pharmacop.,) formerly known under the name of *Hiera Picra*, or holy bitter, is useful in relieving flatulence, and restoring tone, to the stomach and bowels. Made up into pills by the aid of a proper vehicle, two daily will be found to operate gently.

Though the intense and somewhat nauseous bitter of aloes

renders its fluid preparations not very proper for general use, there may be, in dyspeptic cases, circumstances which may indicate their occasional employment. The spirituous tincture is the least proper; yet it will be found useful in relieving dyspeptic symptoms in persons habituated to the use of spirituous liquors. The compound tincture of the London and Dublin Pharmacopœias, the *Elixir Proprietatis* of Paracelsus, is not more eligible; but Cullen found it successful in curing spasmodic pains of the stomach; (*Materia Medica*, Vol. ii. p. 529); and the ethereal tincture at present in use is supposed to be equally efficacious for the same purpose. The great objection to these preparations is the quantity of spirit which they contain; and which may lead the unhappy dyspeptic to relish an unnatural but pleasing stimulus, which is not less injurious to his corporeal organs, than to his mental faculties. A safer preparation will be found in the aloetic wine, in which the effect of the small quantity of vinous solvent is aided by the combination of warm and spicy aromatics. Given to the amount of one or two ounces (a wine glassful) it is purgative. In smaller doses it is alterative, gently stimulating, and, after a certain time, induces a loose belly, with great relief of all the dyspeptic complaints. In the compound aloetic decoction of the London Pharmacopœia, (*Baume de Vie de la Lievre*,) a useful dyspeptic purgative is found, where symptoms of acidity prevail.

Among these preparations, the practitioner will select what he finds most suited to each particular case; and it will rarely happen, that, under judicious management, any inconvenience will result.

To obviate cavil, however, it may be useful to employ the less injurious form of the compound colocynth pill, the compound gamboge pill, or the compound rhubarb pill, in neither of which the proportion of aloes is so considerable as to cause much apprehension. Whenever this is accounted ambiguous in effect, cream of tartar, with or without sulphur, should be employed. Castor oil and infusion of senna are not well suited for daily use; but the aromatic infusion of the latter, (*Infusum Sennæ Compositum* of the London Pharmacopœia), may be employed for many days successively, not only without inconvenience, but with advantage. To the same head, also, may be referred a preparation, much commended by Mr Abernethy, consisting of equal parts of compound tincture of rhubarb and senna,

(*Tinctura rhei composita*, London Pharmacop.) and (*Tinctura Sennæ*, London Pharmacop. p. 81); or a mixture consisting of eight parts of compound infusion of gentian, two of infusion of senna, and one of tincture of cardamoms.*

Magnesia is much used by dyspeptics, and much commended to their use. But it is chiefly serviceable in palliating the symptoms of acidity; and the observations of Brande and Marcet show that its employment is not free from danger; and that, to prevent bad effects, it should be joined with some more energetic medicine. Custom has sanctioned the practice of uniting it with rhubarb; and, with the view of increasing its carminative powers, ginger has been added, as in the mixture which has been sold under the name of Dr Gregory. Rhubarb, however, is not sufficiently powerful in this preparation to produce, in all instances, a decided cathartic effect; and the magnesia is too often inefficient as an antacid. A better and more powerful preparation I have found in a pill, consisting of five grains of rhubarb, and one of carbonate of ammonia, with mucilage. Though a grain or two larger than the ordinary pills, it is easily taken, and is rarely without effect, both as an antacid and as a mild purgative. When this fails in removing symptoms of acidity, or is otherwise inconvenient, five or ten grains of subcarbonate of soda (*Sodæ carbonas exsiccata*, Lond.) should be given twice or three times daily, according to circumstances.

Another mode of exhibiting this medicine is that employed by Mr Abernethy, who was wont to give either the aloetic pill, or the colocynth pill, in combination with the blue pill, (*Pilula Hydrargyri*,) every second night. The effect of this is supposed to be, not only to rouse the peristaltic action, and discharge feculent matter, but to correct the intestinal secretions, and, above all, to excite the torpid circulation of the liver. It is probable that its chief use is in augmenting the secretion from the extremities of the mesenteric arteries, and unloading the distended mesenteric veins, and by consequence the vessels of the portal system.

In the treatment of indigestion, the remedies known under the name of tonics have been much esteemed, and extensively employed. Most of those which are derived from the vegetable kingdom are of the class of bitters, and undoubtedly possess, in a remarkable degree, the power of increasing the appetite. It

* Constitutional origin and treatment of local diseases, p. 125.

may be doubted, however, to what extent their exhibition with this view is a safe measure, as the impaired appetite is a proof that the stomach is unable to digest the food, and as this disappears in proportion as the healthy action of the bowels is restored. Another point of some consequence in this view, is that several of these bitters, as gentian, quassia, rhubarb, and chamomile, often show a purgative power, (Cullen, Vol. ii. p. 61); and are beneficial, chiefly in proportion to the degree in which they possess this power. They ought, therefore, to be used either after the employment of purgatives, or in combination with them. It is of little moment what bitter is employed. Between rhubarb and chamomile, (*Anthemis nobilis*,) which are the weakest, and quassia, which is most intense, there are bitters of various degrees of strength; and Peruvian bark and calumbo root possess some degree of aromatic power. When used, which is chiefly in infusion or decoction, it is good to add, where the appetite is irregular or morbidly keen, a small quantity of subcarbonate of soda, as an antacid. Upon this principle the alkaline decoction of chamomile, (*Decoctum Anthemidis Alkalinum*,) of the Edinburgh Infirmary, is beneficial. In the same manner the bitter infusion (*Infusum Gentianæ compositum*,) the quassia infusion (*Infusum Quassiae vel Picraenae*,) or the rhubarb infusion, may be rendered more useful by adding from a drachm and a half to two drachms of the subcarbonate of soda to each pound of the preparation. Of the spirituous preparations, the compound tincture of gentian is the most pleasant, the tincture of rhubarb with gentian the most stomachic, and the tincture of rhubarb and aloes the most effectual. For Peruvian bark, it is the custom now to substitute sulphate of quina, which has the advantage of being equally tonic in a much smaller bulk. The dose is from one to two grains, twice or three times daily.

Among the tonics from the mineral kingdom, used in the treatment of dyspeptic symptoms, the nitric and sulphuric acids, and the preparations of iron and bismuth, hold the first rank. Nitric acid is supposed to be particularly indicated where the hepatic circulation is languid, and the biliary secretion disordered. It is sometimes particularly useful in cases of asthenia. The sulphuric acid in the form of elixir of vitriol, (*Acidum Sulphuricum Aromaticum*,) has been long known as a safe and efficacious medicine in all cases of stomach disorder, with uneasy heat of

the surface, and great loss of appetite and general strength.* The dose is 20, 30, or 40 drops, four or five times daily.

Of the chalybeates, the best are the sulphate, the carbonate, and the muriate. The first is powerfully tonic in small doses of from one to five grains, twice or thrice daily. The carbonate is almost insoluble, and may therefore be given in larger doses, from five grains to half a drachm, a whole drachm or four scruples, twice or three times daily. It appears to have no sensible operation, unless that of opening the bowels gently, which is never the case with chalybeates in general. The muriated tincture is the most powerful, and perhaps the most useful of the chalybeates. In very small doses it acts with energy on the stomach and bowels, increasing the appetite, and improving the general strength. The alkaline combinations of iron are well suited to some forms of dyspeptic disease. Perhaps one of the best is the tartarized iron, (*Tartras Potassæ et Ferri*, Ed.) which may be given in doses of from five grains to a scruple two or three times daily. Of the alkaline liquor of iron of the London Pharmacopœia we have no experience; but from the testimony of Dr Powell and other authorities, it appears to be an effectual tonic in cases of indigestion, with much weakness and relaxation of the stomach, and of the general system. In the administration of the chalybeates, an invariable rule ought to be, never to give them while the tongue is foul, the lips and gums hot, or the bowels much bound; and never to give them unless after the employment of purgatives, and along with purgatives.

The magistery of bismuth, which is supposed to be either a dinitrate or a trisnitrate, was found by Odier of Geneva to be an efficacious remedy in stomach-ach (*gastrodynia*,) in doses of from one to twelve grains. This remedy appears to have peculiar efficacy in relieving and assuaging the severity of stomach-ach. It is not well known in what manner it acts. Some suppose that it operates as a directly soothing agent or sedative, others as an absorbent of acid, and others as a direct tonic. The magistery of bismuth should not be administered till the bowels have been thoroughly cleared; and even during the time the patient is taking it, care should be taken, by the use of laxatives and diet, to obviate constipation. A general fact regarding these

* When the appetite has been deficient, I have been accustomed to recommend acids as medicines; when, on the contrary, it has been good, and the digestion difficult and imperfect, I have recommended bitters and alkalies."—Abernethy, p. 177.

metallic preparations is, that they give a dark colour to the excrements,—an effect which depends on their union with hydro-sulphurous acid.

The use of hydrocyanic acid as a remedy in dyspeptic disorders has been very strongly recommended by Dr Granville and Dr Elliotson. The hydrocyanic acid used at first in medical practice was that obtained by the process of Scheele; and either this or a modification of it is received in the Dublin and in the American Pharmacopœias. As the acid obtained in this manner, however, is liable to vary in strength, the process proposed by Robiquet and Villermé is conceived to be the best, and is consequently the one adopted in the new edition of the Edinburgh Pharmacopœia. This furnishes hydrocyanic acid diluted with about thirty parts of distilled water. Of this acid about five or seven minims may be given once or twice daily according to its effects, when stomach-ach is acute and excruciating. Its operation seems to be directly sedative.

As, however, no medicinal agent has given rise to so many calamitous accidents, it becomes necessary to administer it with the greatest caution; and it is quite unsafe for the physician to prescribe such a medicine, unless the patient be under his constant and unremitting inspection.

Kreosote is another medicinal agent which has of late years been very much employed as a means of relief against *gastrodynia*, vomiting, and other dyspeptic symptoms. The observations of Dr Elliotson, who tried it in a great variety of gastric affections, idiopathic and symptomatic, show that it possesses a remarkable power of assuaging the violence of gastric pain and the severity and frequency of the vomiting in ordinary cases of idiopathic dyspeptic disorder. But as it is always doubtful whether these symptoms might not be assuaged with equal facility, and certainly by means of other agents, it becomes a question whether the administration of kreosote be indeed requisite in cases of dyspeptic disorder. When it is determined to administer the remedy, it may be given in doses of one minim once or twice in the day in an ounce or two ounces of distilled water or spring water. (Medico-Chirurg. Trans. xix. 217.)

In general, evacuation of the intestinal canal by suitable purgatives will have the effect of relieving all the uneasy sensations about the epigastric region. But if this part still continue tender, and if squeamishness be a frequent symptom, the best practice is to apply twelve or fifteen leeches to the pit of the stomach,

to repeat this local bleeding if the pain do not wholly disappear, and afterwards to apply a blister. Many cases of obstinate and tedious dyspeptic symptoms, which are aggravated and protracted by bitters, chalybeates, and other tonics, yield at once to this treatment. It is to me almost certain that, in such instances, a degree of chronic congestion of the vessels of the stomach or of its mucous membrane is the main cause of all the complaints. (See and compare Vol. i. p. 877—881.)

But whatever benefit may result from opening the bowels by purgatives, and removing the immediate inconvenience of constipation, whatever advantage may be gained by increasing the appetite and removing disagreeable sensations by means of tonics, alkalies, and other means of relief, medicine is never adequate to the final and permanent cure of the disease. After the first inconveniences of constipation are removed by the use of proper purgatives, and the immediate symptoms of indigestion have been relieved by antacids and tonics, the patient should trust to diet, exercise, and the acquisition of regular habits, for removing permanently the symptoms of indigestion.

In the choice of his food he should attend to two circumstances; *first*, that it may be digestible and nutritious, or, in other words, that it may undergo the process of digestion without causing heartburn, load at the stomach, flatulence, hiccup, or other symptoms of acidity; and, *secondly*, that its residual part may pass through the intestinal canal without causing either griping and looseness, or obstinate constipation. It is impossible to lay down rules to suit every individual case, for this would require a treatise on dietetics; and each patient should be taught to remark the respective effects of different kinds of food and drink on his symptoms, and on the state of his digestive organs.

We may mention, however, that, in general, the following articles will be improper where there is any degree of indigestion. Articles containing fat or oleaginous matters, as butter in almost every form, especially melted; rich sauces; pastry; lamb, pork, bacon, sausages, especially the Bologna, and almost every species of very fat meat.

The fat or oily fowls; as goose (*Anas anser*), puffin (*Mormon fratercula*), the ortolan (*Emberiza hortulana*), and wheat-ear (*Saxicola ænanthe*), both of which are often a mere ball of fat, and can scarcely be eaten without deranging the action of the stomach.

Fishes abounding in oil, the holibut (*Pleuronectes Hippoglossus*), especially the flesh of the side fins; mackerel (*Scomber Scomber*), and most of the red fishes, as salmon (*Salmo Salar*), salmon-trout or sea-trout (*Salmo Trutta*), herring (*Clupea Harengus*), sprat (*Clupea Sprattus*), shad (*Clupea Alosa*), and anchovy (*Clupea Encrasicholos*), especially in sauce, as it is usually prepared.

The fat of the green-turtle (*Testudo Mydas*), (*Chelonia Mydas*, Brongn.)

Several shell-fish, as the common crab (*Cancer Pagurus*), and lobster (*Cancer gammarus*); and the muscle (*Mytilus edulis*), at certain seasons, June, July, and August.

Certain forms of albuminous substances, as curds, cheese, hard-boiled eggs, &c.

Newly-baked bread is injurious in two modes. 1. Much more of it is eaten in that shape than when stale; and 2. it is much tougher, and less friable, and consequently, less digestible than when stale. Toasting by augmenting friability renders it more digestible.

Among articles used for drink, tea is generally flatulent, porter acescent with many, spirituous liquors destructive of the powers of the stomach, by their chemical action and physiological stimulus; and wines are safe only when they are moderately old, and not at all acescent.

The safest food for the dyspeptic is beef or mutton, roasted, boiled, or broiled; next to that, the flesh of the barn-door fowl, the wood-pigeon, the young duck, or the turkey pullet. Among game, the safest is the pheasant (*Phasianus Colchicus*), and especially the partridge (*Tetrao Perdix*). To the dyspeptic, fish can hardly be recommended, except plain boiled cod, or the oyster, which are supposed to be digestible and nutritious. In some instances, small quantities of milk given at intervals are retained, where the stomach rejects every other species of food.*

Among vegetable substances, the best are celery (*Apium graveolens*), and asparagus (*Asparagus officinalis*). The carrot is nutritious, but is supposed to be flatulent. Parsnep (*Pastinaca sativa*) is nutritious and laxative. The potato is safest roasted. When the symptoms of flatulence are severe and obstinate, all vegetable substances, except bread, must be abandoned. The dyspeptic should then confine his meals to broil-

* Medical Observations and Inquiries, Vol. vi p. 310.

ed animal food, as beef-steak, broiled mutton, or broiled fowl, with stale bread, and a glass of cold water, with occasionally a little port wine. If he finds he cannot manage this in the morning, he should breakfast on gravy-soup or beef-tea, with dry toast bread, articles which undergo the process of digestion much more easily than any thing else he can adopt. Rice appears to agree well with dyspeptics, especially when taken in strong soup, with a little celery. Biscuit, rusk, and stale bread are more digestible than ordinary bread newly baked; and bread made of coarse flour, of rye, or of barley-meal, will be found useful in obviating constipation.

The safest drink for the dyspeptic is cold water, occasionally with the addition of a small proportion of port wine, or old warm sherry. Of malt liquor, nothing should be tasted except a little old well-bottled ale; but even this is found to interrupt the process of digestion in delicate persons. Ginger-beer is often a useful and safe stimulant to the dyspeptic stomach. Good London porter in moderate quantity proves tonic and digestive with some.

Exercise is of much moment; and it should be carried to the greatest extent to which the strength of the patient allows. To be useful, it must be active, as walking, fencing, swinging dumb-bells, carrying weights, &c. The dyspeptic should rise early, walk for two hours, if possible, or until he feels something like hunger, and take breakfast sufficient to satisfy without overloading the stomach. Rest for an hour or two hours after will facilitate the process of digestion; after which exercise in walking or otherwise will be useful in promoting the transit of the alimentary mass from the stomach into the *duodenum* and *ileum*, and giving a fresh sense of hunger. This may be gratified moderately by a dinner of solid matters in small quantity; after which a state of repose or exertion for two hours will be necessary. Exercise for two, three, or four hours if possible, will then prepare for sleep during the night, which will always be most sound and refreshing, if little is given the stomach to do during the night. A crust of bread, a bit of rusk, or a small biscuit, and a glass of cold water make the best supper.

The cold bath, and especially sea bathing, are of much use in relieving dyspeptic and asthenic symptoms. If the subject is too languid to try the cold bath, he should begin with the warm or tepid sea-bath, and proceed gradually to the cold.

Friction is also beneficial in strengthening the muscles and restoring the capillary circulation and the secretions and excretions to their sound condition.

Another mode of exercise well suited for dyspeptics is riding on horseback, the motion of which is conceived to be peculiarly useful in promoting the circulation in the abdominal viscera, and especially that of the liver, and preventing congestion, and those states of stagnation which are favourable to the formation of hemorrhoids, cutaneous eruptions, gouty pains, and congestion towards the head. This species of exercise is believed to be well suited to those, whose muscular system is so enfeebled, as to render them unable to take as much exercise on foot, as may be adequate to maintain the twofold action of the skin and the gastro-enteric mucous membrane.

When the individual possesses sufficient strength, and when he has also firmness and perseverance, it is of great use to take the benefit of the more laborious exercises, as digging, playing at cricket, playing at bowls, or playing at racket. In general, however, when persons can take these forms of exercise, the symptoms are either not severe, or the cure is almost completed.

It is of the utmost moment for the dyspeptic to regulate accurately and systematically, the hours of meals, of exercise, of rest, and of retiring to repose.

The meals should never be separated from each other by too remote an interval, for two reasons ; *first*, that the stomach may not be too long empty, and much tried with fasting ; and *secondly*, that the patient may not eat so rapidly and voraciously, and to so great amount, as to overload the stomach previously very empty. One of the great sources of dyspeptic disorders in large and commercial, and otherwise busy communities, is the long interval between breakfast and dinner, and the late period at which the latter is taken. Though this practice is carried on by many for a long time with impunity, yet there are few, indeed, who, after proceeding with this system of extreme emptiness and repletion, do not begin to suffer all the evils either of simple or of latent and masked dyspepsia. With a copious dinner at six or seven in the evening, the individual often retires in good time to bed, with a load of undigested food, which irritates the stomach and prevents sleep ; and it is only towards morning, after a restless night of tossing and sleeplessness, that he falls

into a broken sleep with a profusely perspiring skin, and rises not unfrequently more fatigued than when he retired to bed.

Dyspeptics, in order to avoid these evils, should dine at two, if possible, and never later than four. If any thing be taken in the evening, a little milk and water, or weak tea and dry toast or rusk is best.

In the treatment of the other forms of dyspeptic disorder, the same general principles are to be observed; but they require to be modified in each.

2. Thus in the management of *pyrosis* or water-brash, though the same general dietetic and medicinal measures be required as in ordinary dyspepsia, and especially the removal of all the remote causes, as bad bread, the use of spirits, &c. yet out of the phenomena of the fit rises a new indication, namely, to allay the severity of the gastric pain, and to put a stop to the ejection of liquor from the stomach.

It is supposed that opium in general presents the most effectual means of assuaging the severity of the gastric pain in water-brash, and hence it has been very frequently resorted to for that purpose. Its use, however, is always followed with the bad effect of enfeebling the tone and energy of the stomach, and consequently rendering it more liable to subsequent attacks of the disorder.

The best and most effectual method of relieving this stomach-ach is, after tracing the disorder to the use of some hurtful article of food or drink, as badly fermented bread, horse-chestnut bread, or the frequent use of spirits,—to stop entirely the use of these articles, and substitute for them small quantities of good nutritious food.

When the ejection of liquor has actually come on, a draught consisting of magnesia and rhubarb in common water is one of the most effectual means of putting a stop to the discharge; carbonate or subcarbonate of soda may also be given in doses of five grains every half hour, till it cease or be diminished. In some instances it ceases after taking a draught of cold water; in others and other persons after a draught of tepid water. All spirituous and ethereal stimulants ought to be avoided.

3. In the management of the third form of the disorder, viz. *asthenia*, or the chronic weakness and atrophy of large and densely peopled communities, medical treatment, properly so named, is still less effectual than in any other; and next to the use of very gentle

laxatives or rather mere diet, to regulate and restore the natural action of the bowels, the most important measure is immediate removal from the locality where the disease has been contracted into purer air, either in the country or by the sea side. Cool pure air unmixed with the dust and exhalations of towns assuredly affords the most important means of relief and cure; and next to this, relaxation from the fatiguing and enfeebling employments carried on in populous communities, is a most essential condition in enabling the patient to recover his health. Willan was of opinion, that the inhalation of the odours from growing vegetables imparted a grateful and salubrious stimulus to the system, so as with the change of pursuits, and a more regular plan of diet and exercise, in a short time to restore vigour to the body, and with it firmness and serenity to the mind. Certain it is, that all medical and dietetic means may be tried with the greatest industry and perseverance, without any beneficial effect, while the patient remains in town engaged in his usual occupations; but as soon as he quits these, and repairs either to a country or a maritime situation, all his symptoms gradually and sometimes speedily disappear.

It is upon the same principle that travelling or frequent change of place is often found of very great benefit to asthenic sufferers; and whenever circumstances admit its employment, it may be resorted to with great confidence as a means of recovery.

4. In the treatment of the *marasmus* of infants and children, the practitioner must first examine the belly most carefully, and after having satisfied himself of the presence of the disorder, the next thing is to exhibit cathartic medicine, to inspect the matters discharged, and see what effect is produced in the abdominal tumour. In general, the matters first expelled are solid, consistent, scybalous, and of a light clay-colour, without much of the characteristic feculent odour. In some instances, it is stated by the friends, that the bowels are unusually loose, and that purgative medicines always do harm when tried. But to these statements the practitioner must pay no attention, if he wish to cure his patient. He must observe the effects of the medicines, and inspect the alvine discharges daily, and judge for himself, without either taking his information from relatives or nurses, or having his judgment guided by their opinions. This is the only mode in which he can guard against imposition and deception, not intentional, indeed, but not the less injurious on that account.

Another formidable enemy against which the practitioner has to contend, in the management of this disorder, is the fancy of weakness and debility being induced by the daily or frequent employment of cathartics ; and unless he is very firm, he is in great danger of being thwarted by the frequency and the plausibility with which this phantom is arrayed against him. The best plan is to pay no attention to the various fancies and notions thus diligently employed to disconcert him, but to examine the belly carefully, both by palpation and percussion, to look at the motions, to count the pulse, examine its state as to variability, ascertain how the patient sleeps, examine the eye and pupil, and the temperature of the head ; and give his directions accordingly.

In general, as the bowels are regularly emptied, not only does the abdominal swelling subside, and the discharges assume a more healthy character ; but the child is less fretful, sleeps better, and begins to evince marks of appetite. The eye also is clearer, the complexion more natural, and the skin is softer, and less harsh and dry. Then the breath loses its fetid smell, and the pulse becomes less frequent.

The cathartics to be employed in the treatment of this disease should be changed from time to time ; because sometimes one kind of laxative that has been efficient when first tried, begins, after being several times administered, to be less powerful, and to lose its effects in part, or altogether. In general, the best plan is to begin with the compound colocynth or aloetic pill, six, eight, or ten of which sometimes require to be given before any effect is produced. Their exhibition should be followed next morning by four ounces of the saline infusion of senna, or one ounce of castor oil. The colocynth or aloetic pills may be repeated next evening, and followed or not with the one or other of the same medicines next day. A day may then be passed over ; and one drachm of the compound jalap powder may be given and repeated, or followed next morning by one ounce of castor oil. The following day, that is, omitting one day, if requisite, it is generally now the time to exhibit a full dose of calomel and colocynth, or calomel and jalap, to be followed next morning by a dose of compound jalap powder, or the saline infusion of senna.

In general, after the bowels have been well emptied by these medicines, it is possible to recognize a decided improvement, and consequently, to give the patient some respite from treatment.

But if there be not a decided improvement in the appearance of the belly and the general symptoms, it is proper to have recourse to the auxiliary influence of injections, morning and evening, and to put the patient in the warm bath every second night.

As the disease continues to recede, it is requisite to increase the amount and improve the quality of the diet. It is also necessary to exhibit some of the light tonics, as gentian or calumbo, either alone or with infusion of senna, to obviate constipation. The great point, however, is to send the patient to the country or the sea side, where he may have an opportunity of breathing fresh air, and obtaining gentle exercise and recreation.

Flannel clothing, which is important in all forms of dyspeptic disorder, is particularly so in this.

5. In the management of green sickness, next to the use of eccôprotic medicines, the great remedial means consist in the use of chalybeates in different forms. The most common and perhaps the most convenient is green vitriol, (sulphate of iron,) which is generally given in this case, combined with aloes, either in equal proportions, or in the proportion of two parts of green vitriol to one of aloes. In most instances, the best plan is to begin with a pill, consisting of one grain of green vitriol, and one grain of aloes, twice or three times daily, before larger doses or different proportions are attempted. Even in this small dose it is a peculiar character of this combination of green vitriol and aloes, that it purges smartly, with much griping and some pain. If this be the case, the next best plan is to give three times daily a pill, containing two grains of green vitriol, and one of aloes, and sometimes it is desirable to add one-third of a grain of opium. But this is seldom requisite in chlorosis, and is better suited for cases of amenorrhœa, without chlorotic symptoms.

Another form of chalybeate, found at one period of great benefit in chlorotic cases, was the mixture employed by Dr Griffiths, and, therefore, named from him, consisting of green vitriol, carbonate of soda, and myrrh. Though in this combination, mutual decomposition of the green vitriol and soda take place, and there is formed an insoluble precipitate of carbonate of iron, yet this mixture was long in great use as an antichlorotic of considerable and almost unfailing efficacy. As, however, in the liquid form of ink, it is generally offensive to the stomach, Willan was in the habit of giving the separate precipitate with myrrh or any other ingredient made up into pills. The medi-

cine was afterwards introduced into the London Pharmacopœia in 1809 (*Ferri carbonas*, *Ferri subcarbonas*, 1815), and must be regarded as a convenient and powerful chalybeate in the treatment of *chlorosis*. (Willan, Reports, p. 294.) The salt may be given in doses of from five to eight or ten grains, three or four times daily. Another convenient mode of administering the carbonate is by giving the saccharine carbonate of iron of the New Edinburgh Pharmacopœia, (p. 97), which is a mixture of carbonate with sugar, and may be given in doses of five grains three or four times daily.

Iron may also be given in other forms for the removal of chlorotic symptoms. Thus the tincture of the muriate of iron, which is a solution of hydrochloride in spirits, is a very excellent remedy in this disorder, and has the advantage of being easily borne by the stomach. It is given in doses of twelve or fifteen minims three or four times daily in a little water.

Lastly, another form in which iron has been recently recommended as particularly efficacious in the removal of chlorotic symptoms, is the iodide or ioduret of iron, formed by combining iodine and metallic iron. This, which was proposed in 1834 by Dr Anthony T. Thomson, is given by him in doses of three grains, three or four times daily, dissolved in distilled water. It might also be given in pills.*

I have tried the ioduret of iron in chlorotic cases to some extent; but it does not appear to possess any great advantage over the sulphate or the carbonate of the metal, at least in the management of cases presenting symptoms of chlorosis.

I should, perhaps, have mentioned what will be afterwards noticed under another head, that, in cases of *chlorosis* in females, it sometimes happens that one or other of the white opaque mucous discharges of *leucorrhœa* is present. In this class of cases it is desirable to remove this discharge as soon as possible; but as it usually depends on the presence of uterine catarrh, or enlargement and chronic inflammation of the uterine or vaginal follicles and mucous membrane, it is important to employ at the same time some of the remedies mentioned under that head. The injection of a strong or concentrated solution of nitrate of silver has been recently recommended; and it is often effectual in suspending the discharge.

* Some Observations on the Preparation and the Medicinal Employment of the Ioduret and Hydriodate of Iron. By Anthony Todd Thomson, M.D., &c. London, 1834.

§. II. *Dyspepsia Larvata. Gastria Larvata.* Masked Dyspepsia.

Joannes Peter Frank *Prolusio de Larvis Morborum Biliosis.* Goettingæ, 1784.—

The Stomach in its Morbid States; being a Practical Inquiry into the Nature and Treatment of Diseases of that organ, and into the Influence they exercise upon the Origin, Progress, and Termination of Diseases of the Liver, Heart, Lungs, and Brain. By Langston Parker, M. R. C. Surgeons, &c. London and Birmingham, 1838. 8vo, pp. 303.

WHEN disorder of the digestive function has either existed long, with or without various intervals of relief, or when it has ceased to produce its legitimate symptoms in one or other of the forms above-mentioned, it begins to manifest itself by a train of anomalous complaints in different organs and regions of the body. These complaints, because they are understood to be unattended with any change of structure, and yet resemble diseases attended with change of this kind, have been comprehended by physicians under the general name of Nervous complaints. The name is not fortunate; for in many of the instances, no affection of the nervous system exists or can be traced. By others, they have been regarded as quite the same as the latent state of gout, or that form of irregular gout to which Cullen applied the name of Atonic. Another supposition is that they are the effect of indigested food, acting on the circulation of the brain and spinal chord, and other organs, much in the same manner in which a poison does. Dr Parry, again, attempted to show, that they depend on some irregular state of the circulation of the brain, (*Memoirs of the Medical Society*, Vol. iii. p. 77.) But it is impossible to conceive that this would produce symptoms in so many different organs, which are connected in very different degrees, and often very remotely with this central part of the nervous system. It appears more natural to think that they depend on some disordered state of the capillary circulation either in general, or of particular textures and organs, resulting from previous disorder of the circulation, and secretions of the alimentary canal. But without dwelling on the mode in which the pathology of these complaints is to be viewed, I shall merely enumerate their most ordinary forms, as they have been described by the best authors.

a. The first form in which this masked dyspepsia may appear, is in various complaints referred to the head. Of this kind, are headach, giddiness, and derangement of vision, or hearing, or of both. The headach affects either the whole head, especially the forehead, or only one side of it, when it is named megrim,

(*hemisrania*;) sometimes one eye, with the contiguous part of the forehead and temple. It may recur daily at the same hour as regularly as a fit of the ague, (Whytt); at other times it ensues on evident disorder of the digestive organs. During its continuance, the eye is heavy, and appears as in a person who has wanted sleep, or has been drinking.

It is generally attended with more or less giddiness, with weight, and a painful sense of distension of the eyeballs, and sometimes with a peculiar sense of coldness in the scalp. In some cases, the giddiness is so intense and stupefying, that the patient falls down senseless, as if he had been stunned by a blow, and continues in this state of stupefaction for some time. The sight also is dim or misty, in some instances so weak as to approach to amaurosis; and sometimes the patient sees distinct spectral colours, blue, yellow, red, green, in various forms, and succession. In other instances, *muscæ volitantes* are the principal form of the complaint, (Warren in Medico-Chirurgical Transaction.) The ears also frequently tingle, and the patient thinks he hears bells ringing at a distance, or water running, or some noise, which has no existence, or at least no physical cause.

The duration of these symptoms is various in different individuals. They may last only one hour, but more frequently several. When the complaint assumes the form of a stupefying giddiness, it may last not above twenty minutes or half an hour. They are sometimes connected with evident disorder of the stomach, as squeamishness, sickness, and vomiting; but in all cases, they are connected with a very slow and habitually bound state of the belly. For more minute information, the reader may consult the works of Whytt, and the papers of Fothergill and Warren, on sick-headach.

Perhaps under this head ought to be mentioned, the Nervous Apoplexy, described long ago by Zuliani,* Kortum,† and Kirkland,‡ and more recently much spoken of by Abernethy,§ and Wilson Philip.|| These authors regard all cases of apoplec-

* F. Zulianus de Apoplexiâ præsertim Nerveâ. 8vo, Lipsiæ, 1780.

† Caroli Georg. Theodori Kortum Tremonia-Westphali, Dissertatio de Apoplexia Nervosa, Goettingen, 1785; in Frank Delectu, Vol. vi.

‡ A Commentary on Apoplectic and Paralytic Affections, and on the Diseases connected with the subject. By Thomas Kirkland, M. D. London, 1792.

§ Section vii. p. 422.

|| A Treatise on Indigestion and its consequences. By A. P. Wilson Philip, M. D., &c., p. 275, 273.

tic symptoms, in which no organic lesion can be detected in the brain, as examples of nervous apoplexy, and ascribe its symptoms to disorder in, or diminution of, the nervous energy without organic affection. According to the view already given partly, and to be yet more fully given, of apoplexy, this would not come under the definition there given; and perhaps most of these examples of nervous apoplexy owe their existence to imperfect observation of the symptoms during life, and imperfect examination of the organs after death. All that can be said is, that it is impossible, in the present state of knowledge, to speak with decision on the nature of these affections.

Another circumstance in the pathological relations of this form of masked dyspepsia deserves attention. The disorder of the stomach and alimentary canal, which acts at first as a mere sympathetic irritant of the brain after it has long transmitted the morbid sympathy, at length establishes it as a permanent morbid action in the brain; and thus the cause that was only temporary and partial becomes permanent and general.

The effects of excess in the use of food and drink are well-known in causing congestion of the head, headach, heaviness, drowsiness, and even stupor. The proper course in cases of this kind would be to diminish gradually the allowance of food and drink, and give laxative medicine with small doses of ipecacuanha. Instead of this, however, in general an opposite course is followed; and stimulating liquors, especially spirits, are taken with the view of enabling the stomach to digest unheard of quantities of solid and very nutritious food. It is not necessary to prove that the stomach does not in such circumstances digest food better or more easily with these stimulants than without them; because it has been already shown that the employment of such stimulants not only renders the food more indigestible, but the stomach less capable of digesting them. But it is requisite to say that, so long as the stimulation of the stomach is continued, so long will the sympathetic irritation of the brain be continued, until it be rendered fixed and permanent. From this course one of three effects result. Either the stomach itself becomes the seat of chronic organic disease; or the brain becomes the seat of chronic disease; or both the stomach and the brain are the seat of morbid action, at first perhaps dynamic, but eventually organic.

My limits do not allow me to enter into the full consideration

of the influence of disorders of the alimentary functions in inducing disease of the brain ; but I would refer my readers, who wish more ample information than can be conveyed within the limits of an elementary work, to the treatise of Richond * and the work of Mr Langston Parker. †

Another circumstance tending to obscure the origin and relations of these attacks is the fact, that many affections of the brain are preceded for several days by dyspeptic symptoms, as *anorexia*, faintness, sickness, and even vomiting ; and, when these are attempted to be removed by emetics or stimulants, it sometimes happens, that they are aggravated to a very great degree, and proceed to the fatal termination.

Lastly, the excesses committed at a single meal, sometimes by the sudden overloading of the stomach, induce a degree of stupor quite similar to approaching apoplexy.

The proper treatment of nervous headach will easily be understood from what has been already said. Evacuation of the bowels relieve the immediate symptoms, and future attention prevents the disorder from recurring. As a tonic, the sulphate of quina is useful. The hair should be kept short ; and cold water applied, by means of a towel or a large sponge, to the scalp. The shower bath is also useful ; but if the water falls from too great a height, more harm than good will result. In some instances in which all remedies are unavailing, unless in affording a temporary relief, their complaints disappear gradually after some months or years.

b. The second form of masked dyspepsia which I shall mention is that attended with symptoms of disorder of the lungs.

Whytt enumerates among the forms of nervous disorder, the nervous asthma and the nervous cough. Correctly speaking, every asthma may be said to be nervous, and every cough may be considered as a spasmodic action. The asthma which Whytt referred to this head appears to resemble the ordinary convulsive asthma in its paroxysmal accessions ; and there is no doubt that the appearance and severity of this distemper depend very much on the state of digestion, and the circulation and secretions

* Richond De l'influence de l'estomac sur la production de l'Apoplexie. Paris, 1824.

† The Stomach in its Morbid States ; being a Practical Inquiry into the Nature and Treatment of Diseases of that organ ; and into the influence they exercise.

of the alimentary canal.* But whether we are to regard it as in all instances the result of masked dyspepsia, is a point on which we feel incompetent to decide. Dr Bree shows satisfactorily enough, both from his own case, and from others, that the dyspeptic state of the stomach is very often the predisposing cause of convulsive asthma, (p. 148) ; that dyspeptic symptoms precede, accompany, and aggravate the fit ; and he ascribes his third species of the disease to disorder of the stomach, duodenum, or abdominal viscera in general. (207, Sect xiii.)

There further appears, however, to be a particular form of breathlessness or panting (*dyspnœa*,) which is manifestly the result of disordered digestion.

Its theory I do not perfectly understand, unless it is to be viewed as an instance of disorder in one mucous surface, producing disorder in another intimately connected with it. Has the twofold distribution of the pneumogastric nerve (*nervus vagus*,) to the larynx and lungs, on the one hand, and the stomach on the other, any thing to do with this ?

Of nervous cough, a good example is given by Whytt, in a young girl of eight, (p. 604) ; and the subject was revived by Dr Stanger in 1806, in a good paper in the first volume of the Medico-Chirurgical Transactions.

The remedy in this case was sulphate of iron, given in doses first of three, afterwards of six grains, twice daily with *kali*, or carbonate of soda and myrrh, with nutritive diet of animal food, cacao and jelly, and the use of malt liquors.

One form of cough very urgent, frequent, and violent, oftentimes is observed in dyspeptic persons, especially when the bowels are constipated, and the liver is in a state of *inertia*, to be associated with a relaxed reddened state of the membrane of the throat and an elongated relaxed state of the uvula, which thereby irritates the epiglottis and glottis, and gives rise to frequent coughing. This form of disorder occurs mostly in females and relaxed males of sedentary habits. It is always most certainly removed by the use of laxatives, tonics, and good diet.

These symptoms in all probability denote some disorder of the pulmonic mucous membrane. If they are not relieved by art, or disappear spontaneously, they may be aggravated to such an extent, as to constitute chronic catarrh, or inflammation of

* A Practical Inquiry into Disordered Respiration. By Robert Bree, M. D., p. 121, 136, &c. 145, 148.

the bronchial membrane, with all the ordinary symptoms of hectic accessions, night sweats, and wasting and loss of strength. This is the disease described by Mr Abernethy under the name of pulmonary irritation from disorder of the digestive organs, (p. 229), and more particularly by Dr Wilson Philip as a variety of consumption, (the dyspeptic,) in the seventh volume of the *Medico-Chirurgical Transactions*, (p. 498), and in his work on Indigestion. It is preceded by lasting and obstinate symptoms of indigestion, by breathlessness, and violent paroxysms of cough coming on, and continuing for some time after eating, or in the recumbent position. The emaciation is less rapid, and the hectic fever is generally formed later than in the usual kinds of pulmonary disorganization.

The treatment consists in the exhibition of purgatives until the stomach and bowels are put in good order, and the excrements are natural; in the use of sulphuric acid with gentian or other bitters; and in the cautious use of nutritious but not stimulating food. Spunging the surface with cold water, either alone or mixed with one-third of vinegar, is useful in abating the external heat, diminishing the sweatings, and restoring strength. Dr Wilson Philip speaks highly of the beneficial effects of giving one grain of calomel combined with the compound extract of colocynth every second or third night, desiring the patient not to go out next day, till the mineral shall have passed off; and if it do not, in a couple of hours after rising, to aid its action by a moderate dose of salts. This mode of treatment, however, is only suited for cases in which there is no evidence of active tubercular disease.

c. The next variety of masked dyspeptic affection is, when it appears in the form of disorder in the action of the heart.

Palpitation or violent and irregular action of the heart is in general a symptom of some disease affecting that organ, as inflammation, enlargement, contraction of the orifices, disease of the valves, and similar changes of structure. It was early remarked, however, by Whytt, * and afterwards by Cullen, † that very severe and alarming palpitation of the heart took place in persons labouring under disturbed or irregular digestion. The alarming nature of this complaint, which has been repeatedly ascribed to organic and incurable disease of the heart, shows

* Works, p. 712.

† Cullen, *Materia Medica*, Vol. ii. p. 356, 357.

how important it is to distinguish it in practice, both for the character of the physician and the comfort of his patient. To illustrate this maxim, and to demonstrate the curable nature of the disorder, the following short case from Cullen is much in point.

“ A gentleman, pretty well advanced in life, was frequently attacked with palpitations of the heart, which, by degrees, increased both in frequency and violence, and thus continued for two or three years. As the patient was a man of the profession, he was visited by many physicians, who were very unanimously of opinion, that the disease depended upon an organic affection of the heart, as we have just now said, and considered it as absolutely incurable. The disease, however, after some years, gradually abated, both in its frequency and violence, and at length ceased altogether; and since that time, for the space of seven or eight years, the gentleman has remained in perfect health, without the slightest symptoms of his former complaint.” (Materia Medica, Vol. ii. p. 357.)

Cases of this description are not uncommon; and it requires all the skill and ingenuity of the physician to distinguish them from those, which depend upon incurable organic disease of the heart. It is chiefly by examining attentively the history and actual complaints of the patient that this can be effected. If palpitation occurs in a person who has laboured or is labouring under imperfect digestion; if it continues without permanent acceleration of the pulse or heat of skin; if the patient has intervals of tranquillity; if he have not occasional or frequent attacks of fainting (*syncope*); if the irregular action of the heart has not been preceded by rheumatism, and is unaccompanied with breathlessness, cough, scanty urine, or swelling of the feet; it may then be reasonable to think that it originates in disorder of the digestive organs. The stethoscope does not afford much information on the nature of the beat as distinct from organic palpitation; but it is useful in ascertaining the presence or absence of serous fluid in the pleura and sometimes in the pericardium; and it may also be employed with advantage to determine whether there is enlargement of the heart or positive injury in the lungs.

I have observed a considerable number of instances of palpitation in young persons in connection with disorder of the stomach or mental anxiety, and in comparison with that dependent

on cardiac disease ; and I have been led to draw the following conclusions:

In palpitation dependent on indigestion, either with or without mental anxiety, the consciousness of the motion of the heart, and its beating against the side, is stronger and more distinct than in that dependent on cardiac disorder ; and it is invariably aggravated to the feelings of the patient, while he thinks on it and directs his attention to it ; whereas it is not increased to the inspection or examination of the observer. In some instances the complaint seems to be merely the consciousness of the beating of the heart ; because, though it be the source of great distress to the patient, yet it is neither observed by the eye, nor recognized by the stethoscope, to be performed with excessive force, or over a space of an unwonted extent. Almost invariably the beat is accompanied with the bellows sound ; but this is no indication that it depends on cardiac disease.

In dyspeptic and nervous or hysteric palpitation, the region of the heart emits on percussion a natural sound ; and the apex of the heart is observed to beat in its usual position. In organic palpitation, the cardiac region emits on percussion a dull sound ; and if the heart be enlarged, the beat is observed lower down than natural.

This disorder may take place at any period of life ; but it is most frequent in young persons between fifteen and thirty or thirty-five.

This disorder is very frequent in young students, and those preparing for graduation. It may be always traced to the combined effect of long continued study and mental application, and more or less anxiety as to the result of their studies. It always subsides, however, as soon as the exciting causes by which it was produced cease to operate.

Of the same nature is the preternaturally strong pulsation in the epigastric region noticed by Albers of Bremen (*Medical and Surgical Journal*, Vol. iii. p. 8) ; Allan Burns of Glasgow ; and Baillie (*Medical Transactions*, Vol. iv. 271). Albers and Baillie consider the abdominal aorta as the seat of this disordered action ; Burns thought it might be the apex of the heart made to communicate its impulse through the diaphragm in a peculiar manner. It is at least certain that it is often entirely unconnected with any disease either of the aorta itself, or of any of its branches ; and that, in a very great proportion of cases, it arises

from imperfect digestion and the constitutional irritability resulting from this derangement. (Med. and Surg. Jour. Vol. iii. p. 12, and Med. Trans., p. 27.)

It is more apt to take place at the middle period of life, than at any other; but instances may occur so early as the age of thirty. It occurs in men and women, but more commonly in the former than in the latter; and its most frequent subjects are lean, sallow, sickly-looking persons, who are generally found, upon inquiry, to have long laboured under indifferent health from a bad state of the alimentary function. In one individual the pulsation is much more strongly marked than in another; and in the same person it varies in strength at different times. In some instances it is more strongly felt in the evening than in the forenoon. It is, generally, most distinctly felt when the patient is in the horizontal posture, when the pulsation may be so strong as to be visible to the eye at some distance, when the epigastric region is exposed; at the same time the boundary of the artery may be distinctly felt, and it may occasionally be traced so low as the navel. The pulse is rarely affected in this complaint. It neither intermits, nor is remarkable for unusual frequency of strength or weakness.

It is a very common symptom in females, and especially in hysterical females; and in young females in whom either the *catamenia* are not yet established, or, after having once or twice appeared, are suppressed. In these and in most females the pulsation is very strong and violent, and is accompanied with a well-marked bellows sound, which, however, varies in intensity, —heard by the stethoscope. The impulse is also transmitted through the instrument to the ear with such force, that inexperienced observers are apt to infer that the pulsation arises from aneurism or some similar disease. In general, however, it is found that most of the accessible arteries, as the *innominata*, the carotids and the iliacs, give the same impulse, and are the seat, at least occasionally, of the same bellows sounds.

These sounds are always rendered much more intense under the influence of mental emotion.

When this complaint has once shown itself, it is not apt to subside entirely; but it varies in degree and severity at different times. There is no reason to think that it is dangerous in any other mode than as indicating an unhealthy state of the chylopoietic viscera. From some cases recorded by Morgagni,

Lieutaud, and Albers, there is reason to believe that it denotes occasionally, that disordered state of the intestinal capillaries which precedes and terminates in the black disease (*Melaena*), or hemorrhage from the intestinal mucous membrane.

It is of much moment for the physician to distinguish this disordered action from that which attends aneurism of the abdominal aorta, the celiac, or the mesenteric arteries. This is not easy. But a probable conjecture on the real nature of the complaint may be formed by knowledge of the previous and actual symptoms of the patient, which will generally be found to denote imperfect digestion, or great mobility and irritability of constitution; by the sudden accession of the pulsation; by its not becoming stronger afterwards; by the absence of a hard circumscribed tumour in the epigastric region; and by the absence of distension, and tearing or lacerating pain, which is very generally observed to attend abdominal aneurisms.

For both affections, the proper treatment is the use of purgatives, especially the warm and stomachic preparations. Compound decoction of aloes, (London Pharmacopœia,) tincture of rhubarb and aloes, or the aloetic wine in suitable doses, are the best. Much benefit, also, is derived from the use of the compound infusion of gehtian, or the decoction of quassia with the addition of subcarbonate of soda, in the proportion of two drachms to the pound.

Before quitting this subject, it is requisite to advert shortly to another form of disordered action of the heart. This is irregularity in the cardiac action and occasional intermission. In the healthy state, the cardiac beats succeed each other after regular intervals; that is, each interval is of the same length; and if the cardiac or the arterial beat be examined, it is found to give the same number of strokes each quarter or half a minute. In certain states of the system, however, and in certain forms of disease of the heart, especially its valves, the cardiac beats succeed each other after intervals of unequal or different lengths; and in some instances a beat is lost, or the heart does not contract, or pauses in its action every now and then.

In the irregularity of the cardiac action, several beats succeed each other rapidly, then more slowly, then rapidly in different degrees, and then slowly again, so that if the pulse be felt for one or two minutes, it gives a greater number of beats in one minute than in another, in one quarter of a minute than

another, and in one half of a minute than in another; and in some instances so irregularly do the cardiac contractions succeed each other, that it is quite impossible to number them.

With irregularity in the cardiac action, intermission is often associated; or intermission takes place first, and is succeeded by irregularity, or it succeeds irregularity. The intermission may take place in different modes. It may consist in the loss of a beat after every ten, every fifteen, or every twenty beats; or a beat may be lost after a whole revolution of a minute, and then two or three intermissions or pauses or contraction follow rapidly. It is difficult to trace in these modes of intermission any thing constant or regular; and the intervals, after which they take place, cannot hitherto be positively referred to any well known cause.

Both of these forms of irregular cardiac action, though generally noticed in treating of the varieties of the arterial pulse, must be referred to some perversion or derangement in the mode in which the heart contracts upon its contents. Both are accompanied with a peculiar sensation in the region of the heart, of which the individual is often perfectly conscious, and with which not frequently he is much alarmed; and the intermission is attended with a short and transitory, but rather disagreeable feeling, which is not easily described, but which has received from Dr Gregory the denomination of anxiety. It feels as if there were in the heart something which required to be removed; and this sensation only goes off when the heart begins to act, which it does with a peculiar thrilling jerk,—and returns the moment the pause comes on. This pause, nevertheless, does not produce any feeling like that of approaching fainting (*syncope*;) and the individual is not only perfectly conscious and intelligent, but gives no indication, either in the face or elsewhere, of being ready to faint.

These symptoms of irregularity and intermission have, by almost all writers on pathology and symptomatology, been mentioned as signs of organic disease of the heart, and have been more particularly represented to depend on arctation and ossification of the valvular apparatus, especially the mitral. It cannot be denied that disease of the valves very often gives rise to irregularity or intermission in the action of the heart; but it is also well ascertained, that the symptoms now specified may take place in individuals in whom the heart, and especially the

valves, are quite sound. These symptoms appear especially in those in whom the digestive organs have been disordered, and especially where this disorder is either associated with general nervous symptoms, or with those which denote the presence of anomalous arthritic disorder. In several cases, indeed, symptoms of latent gout betray their presence only by irregularity in the cardiac action, or by fits of intermittence in the action of the heart. In all instances, it may be observed, that irregularity or intermission in the cardiac action is preceded by, or associated with, various anomalous symptoms of imperfect health, not unfrequently of the same kind as those already specified under the head of latent or irregular gout. The appetite is weak or capricious, being at times keen, and at other times very languid. The tongue is covered with a gray or grayish-yellow viscid fur, which produces in the mouth the sensation of a thick viscid paste. The bowels are slow, the motions unfrequent, and the matters discharged solid and scybalous. The patient is thirsty, especially during the night; and while his sleep is usually disturbed and unrefreshing, he awakes in the morning sore and fatigued. The skin is alternately cold and dry, or hot and preternaturally moist. The urine is in general more scanty than natural, and deposits on cooling a brick-coloured sediment. The pulse, cardiac and arterial, is variable and easily accelerated, becoming regular when quick, but irregular and intermittent when slow.

In some instances this irregularity or intermission goes off as the digestive function is improved. In others, an attack of acute disease, as a fit of gout, or an attack of inflammation takes place; and after that is completed, the intermittence and irregularity are observed to have entirely disappeared. In some instances, diarrhoea, an attack of hemorrhoids, or the discharge of a quantity of sandy urine, terminates the attack.

These facts may be employed to illustrate the nature of this affection, and the treatment required for it. They show that it consists in dynamic disorder of the heart produced sympathetically by the disordered state of the alimentary function; and which may be conjectured, if not explained, by the distribution of the pneumogastric nerve and the splanchnic nerve. It is clear that were it not dynamic, it could not subside so easily.

The treatment consists in the use of alkalies and laxatives, moderate diet, gentle exercise, abstraction from business and

sources of mental solicitude or application. In some instances wine and other stimulants in moderate quantity are useful during the attacks.

d. The last variety of masked dyspepsia which I shall here mention is that which appears under the form of disorder in the urinary function ; (*Dyspepsia Lithiasis*).

The connection between the stomach or first passages, and the state of the urinary secretion, has been long observed by physicians in a general manner.

It is known, for example, that the day either after any excess in eating, or after eating improper or irritating articles of food, as pastry, fat meat and cheese, or after the free use of wine, the urine is not only scanty and high coloured, but before it comes round to its natural state, deposits a brick-coloured sediment. It is further known that if for several successive days food, either excessive in quantity, or too stimulating and irritating in quality, be taken, the urine becomes not only scanty and high coloured, but deposits a sediment grayish, yellowish, or reddish, sometimes amorphous, sometimes crystalline, or with distinctly formed sabulous matter. The gray or yellowish sediment consists of lithic acid, tinged with the usual colouring matter of the urine, and sometimes lithate of soda. The red or lateritious sediments consist of lithate of ammonia, or lithate of soda, tinged with a large proportion of the colouring matter of the urine, and more or less of the purpurates of ammonia and soda. In general, the deeper the tint, or the more approaching to brick-red, the more of the lithate and purpurate of soda they contain. In some instances they contain a small proportion of the earthy phosphates.

α. The sediments now mentioned may, with a very slight exception, be formed in the urine by the simple symptoms of indigestion, unaccompanied by prominent or conspicuous febrile symptoms ; that is, they take place only with those ordinary symptoms of disorder which are the effects of indigestion, either from excessive or improper food. When, however, the urine deposits sediments either partially or altogether of a pink colour, this indicates the formation of purpuric acid, and the presence of the purpurates, either of ammonia or soda, or both ; and this phenomenon, again, Dr Prout shows, is a proof that nitric acid is secreted by the kidney,—which never takes place unless

when the system is under the influence of febrile or inflammatory action. *

From these facts, therefore, it results, that when the sediments are grayish, yellowish, or brick-red, they are to be in general viewed as the simple effect of the disorder of the alimentary canal, or the alimentary function, without prominent febrile symptoms; but that, when they are pink-coloured, they are to be viewed as the effect of more or less febrile or inflammatory disorder, including also gastric disorder. The former even may be combined with the latter, or at least with a small proportion of the pink-coloured sediments; and in such circumstances the gastric disorder is associated, complicated with, or aggravated by, the presence of febrile symptoms. The sediments, in such circumstances, consist chiefly of lithate of soda tinged with purpurate of soda. This is liable to take place in persons of gouty or rheumatic diathesis, especially upon occasion of errors in diet, exposure to cold, or any slight febrile indisposition.

The deposition of lithic acid and the lithates is liable to take place at two periods of life.

In the first place, it may take place in childhood, and previous to puberty, more especially in children of dyspeptic or gouty parents. The urine is in general scanty, high-coloured, voided frequently, and with more or less pain and scalding in the urethra. In some instances, the child wets the bed during the night more frequently than children of the same age do.

Though these symptoms may occur to the children of gouty or dyspeptic parents, yet it will be found upon inquiry that the patient has been eating too freely, and has been using very improper articles of diet. Thus in the case of a stout plethoric boy between five and six, who presented this state of the urine, it was first brought on while he was living with some relatives, who, from mistaken kindness, not only made him take animal food at luncheon with some wine or ale, but allowed him to eat freely of almost every dish that was produced, at dinner, and along with this gave him malt liquor and wine. After living for between two and three weeks in this manner, he returned home still more plethoric and stout than previously, but with scanty high-coloured urine, almost as red as if tinged with blood,

* Inquiry into the Nature and Treatment, &c. by W. Prout, M. D. London, 1825. 2d edition, p. 122, 123.

and depositing copiously reddish-coloured sandy matter, or lithic acid and lithate of soda, partly amorphous, partly in the crystalline form. It required a week of low diet, with the occasional use of laxatives, to restore the urinary secretion to its healthy and natural condition. Similar cases to this are given by Dr Willis in his work on the Functional Disorders of the Kidneys.

After the age of puberty, the disposition to the formation of lithic acid diminishes, and sometimes altogether disappears. It is merely liable to recur on occasion of errors in diet, especially if they be long continued, or in consequence of exposure to cold, and other causes which act in deranging the functions of the skin and alimentary canal. Thus travelling, especially if it be continued for several days, and as sometimes happens, during the night, by suppressing, or rendering irregular and scanty the cutaneous secretion, is also accompanied with a heated state of the system, in which the urine is generally scanty and high-coloured, and deposits on cooling a copious pink-coloured sediment, or sometimes a whitish-gray sediment.

About or soon after the age of forty years a considerable change takes place in the urinary secretion. It is observed, that the deposition of lithic acid, which was hitherto rare, or only after remarkable derangements in the functions of the skin and alimentary canal, becomes more frequent, and takes place after the operation of slighter causes, and is more abundant than formerly. The lithic acid is then deposited not only in the form of reddish sand, but sometimes in the shape of crystalline masses aggregated together, presenting the appearance of calculus, and not unfrequently laying the foundation of stone in the bladder, if not voided by the urethra.

In the course of this deposition of uric acid, urate of ammonia or urate of soda, two circumstances deserve the attention of the physician.

The first is, that the persons, in whom this deposition is most usually observed, present in some instances for months, in others for years previously, various symptoms of bad health. These symptoms are much the same as those already enumerated under the head of latent or irregular gout, and those mentioned under the head of irregularity and intermission in the heart's action; and need not therefore be here repeated.

The second circumstance is that, after the urine has begun to deposit lithic acid, and has done so to any amount, a process which is usually attended with symptoms of inflammatory fever,

all the symptoms of anomalous bad health undergo remarkable abatement, and sometimes entirely disappear for a time. In this respect there is a remarkable analogy between this disorder and its effects and gout; and the same kind of alleviation of nervous, hypochondriacal, hysterical, or other complaints, and restoration to comparative health, is observed after the excretion of sand is gone, which is known to take place in the gouty after a smart fit of acute or open gout. These symptoms of disordered action in the heart, or intermission in its action, entirely disappear; symptoms regarded as those of *angina pectoris* are alleviated or disappear; obstinate symptoms of dyspeptic disorder subside; and the patient recovers appetite, and with it greater alacrity of mind and vigour of body.

After the age of forty, nevertheless, the presence of lithic acid or the lithates in the urine is liable to become frequent, or even habitual; and the general health is in such circumstances proportionally impaired. If the attacks be few and rare with long intervals, so as not to wear down the health of the patient, still, as life advances, the urinary organs evince greater and more urgent marks of disorder.

About or after the age of sixty or seventy years, the lithic acid is separated in a different form. At this period, when the kidneys partake in the general feebleness of all the organs, the urine is secreted either neutral, or more or less charged with the earthy phosphates; and the urine, which had previously deposited lithic acid in the form of crystals, separates impure or imperfect lithic acid in the shape of globules, varying in size. This separation of what may be the stalactitic lithic acid is usually attended with more or less pain in the back, and symptoms of irritation in the urinary organs; the general health, and especially the action of the stomach, is much impaired; symptoms of disorder in the nervous system appear; and the patient becomes paralytic, or is destroyed by apoplexy.

ETIOLOGY.—The knowledge of the causes of the deposition of lithic acid in the urine is extremely important, both in preventing the deposition and in obviating its effects when the deposit is going on. It is, nevertheless, not easy to understand either the nature or the precise operation of the causes on which this deposition depends. It may be regarded as established that the deposition of lithic acid by the urine is generally, if not always, preceded by more or fewer of the symptoms of indigestion, with the tendency to the formation of acid in the alimentary

canal. Hence all those circumstances, either in mode of living or diet, which favour the production of acid in the stomach and duodenum, also favour the formation of lithic acid in the urine. Thus, not only indolent habits in general, and excess in the pleasures of the table, but, in particular, indigestible or highly-seasoned food, especially much animal food, and the use of the acescent wines, tend to render the urine sabulous, and to favour the separation of lithic acid. In general, errors in diet, especially in the article of quantity, appear to be most prejudicial; and hence it results that the same causes, which generate the gouty diathesis and the gouty paroxysm, engender also gravel and stone.

The general accuracy of this view is demonstrated by many well established facts. But the following, given by Magendie, may be adduced as much to the point. A merchant in one of the Hanse towns was, in 1814, in the enjoyment of an ample fortune, lived in good style, and kept a good table, in the pleasures of which he indulged with little self-denial. He at the same time suffered much torment from attacks of gravel. A political change, which unexpectedly took place, stripped him of most of his fortune, and obliged him to take refuge in England, where he spent more than a year in a state bordering on wretchedness, and suffering numerous privations; and during this scene of distress his gravel entirely disappeared. Having gradually re-established his affairs, he resumed his former mode of living, and symptoms of gravel again appeared. A second reverse deprived him speedily of all his acquisitions; he returned to France almost in a state of destitution; his regimen was accommodated to his pecuniary means; and the symptoms of gravel again disappeared. Industry restored him once more to comfortable circumstances; he indulged his taste for the pleasures of eating and drinking; and again the gravel returned. It may be observed that this person suffered at the same time from gouty symptoms, the attacks of which followed those of the gravel. Magendie adds, that, if the person had been subjected to different kinds of regimen, in order to ascertain their influence on the presence of the symptoms, the result could not have been more evident, nor the experiment better performed or more conclusive.

The influence of dietetic errors is further shown by the effects of occasional excess in persons habitually temperate.

When such persons eat rather freely, take much animal food at their meals, and take at the same time wine in some quantity, almost uniformly the following day the urine is rather scanty and high-coloured, and deposits a considerable quantity of lithic acid. It thus appears that some time must elapse between the commencement of the operation of the cause and the production of the effect; and in like manner a certain time elapses between the cessation of the cause or causes and the disappearance of the effect.

It still becomes a question of importance and difficulty to determine in what mode the disorder of the digestive organs induces the deposit of lithic acid. To explain this circumstance, it has been imagined that the presence of acidity in the stomach renders the urine acid, and thereby unable to retain lithic acid in solution. I. It is certain that healthy urine contains one-tenth per cent. of lithic acid, and that the latter is precipitated a few hours after the addition of any acid a little powerful, for instance the nitric or muriatic. It is only a matter of doubt whether the acid in the stomach and duodenum can be sufficiently powerful to exercise the effect assumed. II. In the deposition of lithic acid another circumstance may concur, viz. the small proportion of the watery portion of the urine; a circumstance which is very generally, if not always observed when the digestive process is deranged by excess or other causes. III. A third circumstance, which must be allowed to be the most powerful of all, is the azotized state of the system, induced by the habit of taking considerable quantities of azotized or animal matters for food. The existence, the reality, and the influence of this cause, various reasons show it is impossible to doubt. 1. It is observed that lithic acid and the lithate of ammonia are most frequently formed in the urine of those in whose meals animal food forms a large proportion. 2. It is observed that lithic acid abounds most in the urine at that period of life when the growth of the body is completed, and when, consequently, the textures being no longer capable of employing the superabundant azotized matters in the growth and nutrition of the body, these azotized matters are either the source of disease, or are attempted to be eliminated from the system by the kidneys, and by the articular tissues. 3. It is observed that where much active exercise is taken, with a considerable proportion of diluents, though with a good proportion of animal food in the

meals, the tendency to the deposition of lithic acid is diminished, and often it is observed not to take place at all. 4. It is observed that in the lower animals which live mostly on animal food, the urine is very liable to become loaded with lithic acid and lithate of ammonia; and, conversely, in animals which live mostly on vegetable aliment, lithic acid is either scanty and rarely generated, or it is totally absent. IV. A fourth circumstance which has doubtless some influence, is the frequent use of hard or tart fermented liquors, such as ale and some of the acidulous wines. The influence of these liquors in inducing acidity of stomach, gravel, and gout is so well established, that few doubt the accuracy of the conclusion. At the same time, as their use is not in all followed with the same effect, they can be allowed only an accessory or concurrent influence with other causes. With regard to cyder, it is remarkable that in Herefordshire, where this liquor is liberally drank, gravel or lithic acid in the urine is almost unknown. Devonshire is said to enjoy equal immunity.

The treatment of this form of masked dyspepsia must be conducted on the general principles of improving the process of digestion; counteracting the tendency to acidity; and allaying the irritation of the urinary organs.

The first indication is to be accomplished by means of the medicinal and dietetic rules and remedies already specified. The second may be more easily fulfilled by the use of alkalies, the alkaline carbonates, lime-water, the occasional use of the warm bath, residence in the country, and the employment of the Malvern or Cheltenham waters. To fulfil the third indication, it is requisite to employ warm or tepid bathing, opiates and sedatives in general, diluents moderately, to detract small quantities of blood from the lumbar region, and, at the same time, to defend that region from the effects of cold by the use of flannel rollers.

In some instances, the stimulating diuretics have been observed, especially when combined with opium, to be useful in this disorder,—chiefly by the property which they possess of bringing away more or less lithic acid. Thus, Dr Henry mentions cases in which the use of a remedy composed of turpentine and laudanum was followed by the excretion of large quantities of lithic acid.* In other instances, a combination of mu-

* On Urinary and other Morbid Concretions. By W. Henry, M. D. *Medico-Chirurgical Transactions*, Vol. x. p. 136.

riatic acid and opium may be given with the same intention and effect.

Regarding the propriety of the long-continued and liberal use of the alkalies some doubts may be entertained. Dr Henry shows, from the effects of the use of these agents, that it is very doubtful if they either cause the solution of uric acid calculi, or prevent the deposition of lithic acid, in any other mode than by inducing the deposition of the earthy phosphates. The most useful mode of exhibiting these remedies is believed to be the super-carbonate, or, at least, in combination with carbonic acid. When, on the other hand, any of the alkalies is given in combination with a vegetable acid, as the citric or tartaric, for instance in the form of the citrate or tartrate of potass, in general the formation of lithic acid at first, and afterwards of the triple phosphate is favoured. The citrate of potass, therefore, both neutral and in the effervescing form, with the tartrate, ought to be avoided.

The great point is first to rectify the state of the circulation and secretions of the alimentary canal and the liver; and then to inculcate the use of dietetic measures, such in quantity and quality that these secretions are not likely to be again deranged.

With the first intention, gentle but efficient aperients ought to be given. The compound colocynth pill with a blue pill, or the compound colocynth pill with six or eight grains of calomel, may be exhibited every second evening. If these do not appear to act with the necessary energy upon the secretions and excretions of the intestinal tube, then it may be requisite to exhibit the compound calomel pill, or a pill consisting of equal parts of blue pill and antimonial powder, every second or third evening, followed by the saline infusion of senna, or half an ounce of castor oil in the morning.

These means, however, will exert only a partial and temporary influence, unless they be aided by the more durable influence of proper dietetic measures. In the treatment of no disease, perhaps, is moderation and temperance in the use of food and drink more requisite; and unless not only attention be paid to the quantity, and also to the quality and variety of the articles used as food and drink, medical treatment will be of little avail. The food should be moderate in quantity, never taken so as to load the stomach or induce feelings of weight, distension, or the eructation of indigested food; it should be simple in

quality, not highly seasoned, and not consisting of various articles at the same meal; and no articles ought to be taken either as condiments, liqueurs, or drinks, to promote or facilitate digestion, as it is usually and erroneously said.

Along with these measures, calculated to act on the alimentary canal, it is of the utmost importance to maintain the constant and vigorous action of the skin by the habitual use of warm clothing and the frequent employment of the warm bath.

When the symptoms assume a more acute form, and present the characters of inflammatory action and fever, then the treatment specified under the head of Nephritis, becomes either wholly or in part requisite; and it is only when these symptoms are moderated that the treatment now specified becomes admissible.

In several instances, as the treatment must be continued for a considerable time, in order to be beneficial, it is desirable not only to adhere to the dietetic restriction for a long period, but sometimes to employ a course of those mineral waters which exercise most influence on the functions of the alimentary canal and those of the kidneys. The Malvern or the Cheltenham waters, in this country, are believed to be beneficial along with the alkaline, and slightly alterative method by means of calomel or blue pill, or the cretaceous mercury. These waters are laxative or purgative according to the extent to which they are taken; but it must be remembered that even much purging is detrimental. In other instances, the mineral waters most indicated in the treatment of the lithic acid diathesis are those which contain more or less of the alkaline carbonates. Of this kind the best are the hot waters of Vichy in Auvergne, which contain large quantities of the bicarbonate of soda; those of Mont d'Or in Auvergne; those of Carlsbad in Bohemia; and those of Seltzer, Pyrmont, and Obersalzbrunn. The cautions already mentioned regarding the use of alkaline remedies must nevertheless not be forgotten.

6. The tendency to deposit lithic acid is, under certain circumstances, and in particular patients, followed by a tendency to deposit oxalate of lime. This may take place in either sex. It may occur before puberty, and at all ages between that and forty or fifty years, at which time it is most frequent. It almost never takes place beyond sixty years, and seems, therefore, not to be a disorder of advanced age. It is occasionally associated

with gout. This deposit occurs most generally in individuals who present the appearances of sound constitution and good health. It is invariably preceded by the lithic acid deposit, and after it has taken place for a little, it is then followed by that deposit.

These facts show that the deposition of oxalate of lime depends on the same causes which favour that of lithic acid. It also requires the same management.

7. In certain circumstances, after the lithic acid diathesis has subsisted for some time, especially under the operation of any cause or causes, which render the urine alkaline, another change may take place. The urine becomes paler, and its quantity is increased, or a considerable increase in the amount of the secretion alternates with unusual scantiness. The urine is then pale-coloured, and contains amorphous or uncrystallized sediments, which are found on examination to consist of lithic acid or lithate of ammonia, with more or less of the phosphates intermixed, that is, either the phosphate of lime or the phosphate of ammonia and magnesia, or the two conjoined. As this tendency advances, the urine is often observed, after standing a few hours, to have its surface covered by a thin iridescent pellicle, which is found to consist chiefly of the ammoniaco-magnesian or triple phosphate. When urine of this kind stands a little longer, especially in warm weather, it exhales a very offensive odour, is found to have become partly putrid, and often presents spicular crystals of the triple phosphate.

This state of the urine, which may be regarded as the first stage of this disorder, is most commonly observed in sickly children, in whom the functions of the digestive organs are more or less deranged; but it also occurs in adults with the lithic acid deposit, in consequence either of the operation of those causes which disorder the functions of the stomach and bowels, whatever these may be, or in connection with the gouty diathesis.

As the disorder proceeds, the morbid state of the urine becomes more manifest, and is attended with more serious and decided symptoms,—all of which may be regarded as indicating the second stage of the disorder. The urine is then of a pale colour and whey-like appearance; it is alkaline when voided, or speedily becomes alkaline; and upon examination the lithate of ammonia is found much diminished or entirely gone, while its place is supplied by the triple phosphate.

The same transition from the lithic deposits to that of the

phosphates, may take place through the intermediate channel of the oxalate of lime or the cystic oxide.

Though the phosphates are thus deposited in the amorphous or uncrystalline form, they may also be deposited in the crystalline form. In the latter they assume the appearance of white shining crystals. On rare occasions these contain a little phosphate of lime, but most usually the crystalline sediment of the phosphates consists of the triple phosphate of ammonia and magnesia. This form of morbid state of the urine may take place alone; but most usually it succeeds, as now mentioned, the lithic sediment, and is accompanied or alternates with the pale-coloured amorphous lithic sediment, or the amorphous sediment of phosphate of lime.

The symptoms with which it is attended always indicate very considerable derangement in the functions of the alimentary canal, with much nervous irritation, more or less pain or uneasiness in the back or the site of the urinary organs, frequently with a sense of general lassitude and languor. The urine is generally pale-coloured, and presents after standing the iridescent pellicle, which upon examination is found to be triple phosphate crystallized, while minute crystals of the salt attach themselves to the sides of the vessel. Urine containing this salt is generally of high specific gravity, and contains much urea, and consequently is liable to undergo rapid decomposition, become alkaline and putrid. In other instances the density may be low,—a circumstance probably to be ascribed to the quantity of diluent. When the salt is copious, it is liable to be deposited before being voided, and then the urine is perfectly alkaline, and the sediment appears at once immediately after being voided. These two circumstances may be adopted as indications of the severity of the disorder.

Though this disease appears so completely as an affection of the urinary secretion, yet, as it never takes place unless after long previous disorder of the digestive functions operating upon the urinary secretion, correct pathology, if it do not compel us to regard it as referable to the head of gastric disorder, must nevertheless oblige us to admit, that the causes inducing the disease are all to be sought for in those which act detrimentally on the stomach and its functions. Thus, not only excess in the use of articles of food and drink, and indolent sedentary habits, that is to say, the habit of eating and drinking more than with the

habits of the individual, the alimentary canal can apply to the purposes of mere nutrition, but the depressing passions and various mental emotions have the effect of giving the urine the characters of the phosphatic diathesis. These passions are followed not only by loss of appetite, a dry state of the mouth and throat, and constant unquenchable thirst, but with a dry hot state of the skin, especially the palms of the hands, very great constipation, or constipation alternating with diarrhoea, sleeplessness, and restlessness. It is also an additional proof of the great influence of disordered digestion in inducing this morbid state of the urinary secretion, that it takes place in children with constitutions of much irritability, and always in connection with derangement in the digestive functions. I have already noticed the readiness with which this state of the urine is liable to succeed the lithic condition, when alkaline medicines are administered for the removal of the symptoms of lithic acid. It is also observed, that the employment of mercury in certain constitutions is liable to give rise to the same state; and it may be added, that very often in persons who have been subjected to the influence of repeated courses of mercury, the use of the mineral is followed first by the phosphatic diathesis and state of the urine, and then by albuminous impregnation; and the presence of the phosphatic salts and the albumen, as indicated by the application of heat or the use of re-agents, alternates in the same individual until the latter predominates. In such circumstances, it will be afterwards shown, that there is reason to believe that the cortical or secreting texture of the kidney is becoming diseased, and transformed into red or gray granular matter.

The presence of the triple phosphate, as now described, is liable to take place not only in the young, and in the adult beyond forty, who have previously presented symptoms of lithic deposition, but also in persons more advanced in life, and is often associated with latent or erratic gout, and not unfrequently with incipient symptoms of disease of the brain, which is about to terminate in apoplexy or palsy. Such persons present symptoms of loss of memory, imperfect motion of one or both members, various morbid sensations in different parts, as unusual heat or unusual cold, and, with symptoms of indigestion, spend bad nights. At length giddiness and confusion, followed by loss of motion in one side or both, and sometimes temporary loss of consciousness, place the nature of the disorder beyond doubt.

In other instances the phosphates appear in the urine in the amorphous or uncrystallized form; and then they consist invariably of a mixture of the phosphate of lime and of the triple phosphate of magnesia and ammonia. Though the proportions of these vary in different cases, the phosphate of lime is in general most abundant.

The symptoms indicating this state of the system are always conspicuous, severe, and urgent. With great irritability of the system, flatulence, nausea, and anasarca, are combined; constipation alternates with violent and enfeebling diarrhoea, in which the motions are black and tarry, or clay-coloured, or frothy like yeast. The patient complains of pain, weakness, or uneasiness in the back and loins; the countenance is pale and haggard; the features become pinched and contracted; the flesh wastes, and the health declines rapidly.

The urine in this disorder is always pale-coloured, and in general copious, in which case its density is very low, 1.001 and 1.002 for instance. In other cases it is less abundant, and its density is higher, approaching to natural, viz. 1.020, 1.025, but rarely beyond this. In the first case the urine is pellucid and colourless, like hysterical urine, and deposits no sediment. In the second case, it may be opaque and turbid when voided, and deposits after standing a copious sediment of the mixed phosphates, in the shape of a minute powder. In all cases the urine is prone to decomposition, becomes alkaline, evolving ammonia, and emits an offensive odour.

Though this state of the urine is always connected with disorder in the digestive organs, either manifest or latent, there are, nevertheless, various local causes under the operation of which it is most liable to take place. Thus it not only succeeds the lithic diathesis, as induced by previous disorder of the alimentary function, but it takes place after various mechanical injuries, the effect of which is either to irritate the urinary organs, or to impair or disorder the influence of the nervous system over them. Thus, a fall on the back, a blow or injury of the lumbar region, concussion of the spine, stricture of the urethra, foreign bodies, as catheters or bougies, retained within the urethra and bladder, bits of cloth or wood or balls retained within the bladder, may all be followed by the production of the mixed phosphatic diathesis. There is, nevertheless, almost no doubt, that it is not merely the presence of foreign bodies, but

the morbid state of the urethra and bladder, which renders the introduction of these bodies requisite, that induces by sympathetic irritation that degree and form of disorder in the kidneys, which eventually induces the formation of the phosphate of lime and the mixed phosphates.

Among those general causes which operate through the medium of the stomach and its functions, must be again mentioned the influence of intense and long-continued depressing passions, as anxiety, hope deferred, and grief, excessive fatigue, hard study, night-watching, and, in short, all those causes which derange at the same time the action of the skin, and that of the alimentary canal and the assistant chylopoietic organs.

It is quite unknown by what means these changes in the state of the urinary secretion are effected. The urine loses its acid predominance and becomes alkaline, while a form of urea, which is peculiar in this state for speedily undergoing spontaneous decomposition, is secreted, and along with that lime and magnesia. But why these substances are secreted, or what are the agents inducing their secretion, is altogether unknown. From the fact that similar changes in the urinary secretion take place in consequence of inflammatory softening of the spinal chord, and in the course of diseases of the spine itself, there is strong reason to believe that lesion in innervation, that is in the nervous function or influence, exercises a considerable power in the production of the effects specified.

As to treatment, the primary therapeutic indication is to rectify the state of the alimentary function by all the means specified under that head; the second is to improve the state of the urinary secretion, and, above all, to obviate the formation of morbid products; and to counteract their effects; and the third is to allay general and local irritability.

In order to fulfil the first indication, it is requisite to remove dyspeptic symptoms, both by medicinal and by dietetic measures. The different remedies mentioned under the head of dyspeptic disorders should be employed according to the symptoms and according to the effects produced. It is requisite, however, to be cautious in the use of alkaline medicines, and sometimes to guard against their exhibition altogether. Active, and especially irritant or enfeebling cathartics, are also injurious, sometimes by inducing violent diarrhoea if not present, in other instances, by aggravating it if present. The saline laxatives are less safe

than laxative enemata, or moderate doses of castor oil. Mercurial laxatives even are not safe, and mercury given to affect the constitution is most detrimental and improper. Calomel and rhubarb, however, are often highly beneficial, both in children and adults.

Regarding the second indication, it may be said, that the measures which properly fulfil the first always tend much to accomplish the second. But in general it is requisite to avoid the use of the stimulant diuretics and alkaline medicines. Drink should not be very abundant or frequent; and in general, though employed to quench thirst, ought to possess demulcent or soothing properties, as the vegetable ptisans, *e. g.* barley water, linseed tea, decoction of mallows, and similar articles. Where much pain in the loins is felt, or where the history of the case leads to the inference that congestive or inflammatory symptoms are present, blood may be drawn from the loins by cupping or leeches, and afterwards blisters may be applied, or an issue or seton established. Tonic astringent medicines, as the powder of the bear's whortleberry, gentian, *Alchemilla arvensis*, or any of the analogous agents, are highly beneficial. The extract of the first often agrees when the leaves cannot be endured.

The fulfilment of the third indication is to be accomplished by the administration of opiates and sedatives. Pure opium or Dover's powder may be given in suitable doses. Extract of henbane also (*Hyoscyamus niger*) is sometimes useful as a sedative.

The diet should be mild and digestible. In general animal food must be allowed in the phosphatic diathesis. At the same time it is not certain that vegetable food in moderate quantity, and when it does not become acescent, is hurtful. The most useful kind of diet is best ascertained by experimental trial.

Lastly, it is of essential importance to advert to the state of the mind of the patient. If he suffer under solicitude, fear, or apprehension, or grief, all medical and dietetic treatment will be either wholly unavailing, or of little use; and until tranquillity is restored to the mind, no remedies will exercise any beneficial effect. Residence in the country, moderate and gentle, but frequent and regular exercise, and relaxation from the pursuits and the cares of business, are of indispensable value in the alleviation of the symptoms, and the restoration of health.

BOOK III.

HEMORRHAGIES. *Hæmorrhagiæ.*

Jac. Panzani, Considerazioni patologiche intorno alle cause e fenomeni dell' emorrhagie. Venezia, 1799.—Boehmer, Diss. Pathologica, hæmorrhagiarum in universum spectata. Viteberg, 1799.—Samuel Gottlieb Vogel, Handbuch zur Kenntniss und Heilung der Blutflüsse. Stendal, 1801.—Garnier, Dissertation sur les hæmorrhagies considérées en general. Paris, 1802.—Rey, Essai sur les hæmorrhagies produites par des causes externes. Paris, 1803.—Chretien, Essai sur les hæmorrhagies actives considérées chez l'enfant, l'adulte, et le vieillard. Paris, 1803.—Jusserandot, Essai sur les hæmorrhagies actives du système muqueux. Paris, 1804.—Carl Joseph Meyer, Systematisches Handbuch zur Erkenntniss und Heilung der Blutflüsse. Wien, 1804.—Balthasar Wollkopf, Untersuchungen über die Erscheinung, Bildung und Heilung der Blutflüsse. Leipzig, 1805.—G. A. Spangenberg, Ueber die Blutflüsse in Medicinischer Hinsicht. Braunschweig, 1805.—Kelch, Ueber das Wesen der Heilung der Hæmorrhagien. Kopenhagen, 1806.—Boux, Quelques considerations sur les hæmorrhagies par lesion physique des vaisseaux. Paris, 1807.—Legoues, Essai sur les Hæmorrhagies. Paris, 1808.—F. Lordat, Traité des Hæmorrhagies. Paris, 1808.—Traité Philosophique et Médicale. des Causes Essentielles, Immédiates ou Prochaines des Hæmorrhagies. Par D. Latour, D. M. &c. Orleans, 1815. Deux Tomes. 8vo.—Elements of Pathology and Therapeutics, &c. By Caleb Hillier Parry. Vol. i. General Pathology. London, 1815. 8vo. Hemorrhage, p. 153. cccxvi.

IN establishing an order of diseases under the title of Hemorrhagies, nosological authors since the time of Sauvages, generally employed the single circumstance of an effusion of red blood as the character of the order, without adverting to any other circumstances with which the discharge of blood is attended. Dr Cullen, who disapproved of this as an arbitrary and unnatural arrangement, abandoned it; and attending more particularly to the state of the human body, which gives rise to hemorrhage, and to the other symptoms by which this condition is in general distinguished, restored what he conceived to be a well-founded distinction of hemorrhagies, into those which are *active* and those which are *passive*.

While I agree with our instructor in admitting the justice of this distinction within certain limits, I must express my doubts whether the line has been always clearly drawn, and whether

on some occasions, physicians, both speculative and practical, did not confound these two kinds of hemorrhage together. If there be a real foundation in nature for the distinction, the characters have neither been very clearly defined by authors, nor are the diagnostic signs which they have given sufficient to guide the physician, either in his pathology or in his practice. Thus it has been very generally taught that the *active* hemorrhagies are to be distinguished from the *passive* by the presence of fever;—that is, of increased frequency of pulse, some heat of skin, and other collateral derangement of the functions. But I remark, that even the presence of fever is not always obvious in hemorrhagic diseases, which are generally accounted active, and which, for other reasons, ought to be treated as active hemorrhagies; and it is equally certain, that many of those discharges of blood which are called *passive*, are actually attended with very considerable febrile symptoms, and are best treated by remedies which have most power over the febrile condition.

Again, it has been asserted that active hemorrhagies depend on an inflammatory *diathesis* or disposition, while those of a passive nature are the result of a putrid or dissolved state of the blood. But that no reliance can be placed on this distinction may be inferred from the circumstance, that there is no evidence of the blood ever becoming putrid in the living body; that the condition of this fluid, either in active or in passive hemorrhagies, is very little known; and if it did become putrid, it would produce not hemorrhage, but very different effects.

Thus, although the passive hemorrhagies occurring in certain fevers, in scurvy, and in the purple disease, (*purpura hemorrhagica*,) have been generally ascribed to the putrid state of the blood, pathological examination has shown that they are the result, in the *first* place, of unusual distension, and, in the *second* place, of disorganization of the capillary vessels of the tissues in which the bloody discharges take place.

I observe in the *second* place, that the condition of the blood during hemorrhagic diseases is vaguely and imperfectly known. In some instances of hemorrhage, indeed, as in epistaxis and hemoptysis, pure blood, differing little from that contained in the arteries, is discharged; but in others, it appears to have undergone some changes which are not well understood. This subject may be considered afterwards; but at

present I have only to observe, that in some instances it appears to contain a much smaller proportion of fibrin, or coagulable matter, than during a state of perfect health.

Thirdly, if the blood of the living body ever undergoes the elementary or putrefactive decomposition, it would not produce a discharge of blood, or a genuine hemorrhagic disease. In gangrene, and perhaps in *emphysema*, in which the cellular membrane is occupied with air, there is reason to believe that this gaseous fluid is furnished by the elementary resolution of some part or parts of the blood, probably the serum. But this effect is very different from that of hemorrhage; and when hemorrhage does take place in such an affection, it is the result of the actual destruction of the vascular tissues by the ulcerative process, with which gangrene may be attended. These points, however, may be more conveniently considered elsewhere.

These reasons probably have made it appear more proper, without entirely discarding the division of hemorrhagies into *active* and *passive*, to consider them as *primary* or *idiopathic*, and *secondary* or *symptomatic*. To the first head are referred all discharges of blood or bloody fluids from any of the tissues, structures, or membranes of the human body, taking place without external violence, without ulceration, or, as it is termed, from an *internal cause*. To the second head are referred those discharges of blood or bloody fluids which take place in the course, or toward the termination of fevers, which arise from ulceration or erosion of vessels in the course of mortification, cancer, bloody fungus, ossification, aneurism, or other disease of arteries, the internal use of irritating or acrid poisonous substances, and lastly, those discharges of blood which succeed bruises, wounds, or other mechanical injuries.

The distinction now mentioned, however, is scarcely more capable of general application than that into active and passive, nor does it accord more accurately with correct pathological views. It is easy to show that all discharges of blood are effects, consequences, or symptoms of a certain state of the blood-vessels, or of the textures to which blood-vessels are distributed. No discharge of blood, perhaps, from any membrane, or into the substance of any organ in the human body, can be correctly regarded as idiopathic or primary; for in all cases the discharge is preceded either by inflammatory congestion or actual inflammation, or by some cause which deranges the mo-

tion of the blood in the capillary vessels. The hemorrhagies, indeed, which have been named active by pathologists, are the effect either of inflammation, or a state quite analogous to it; and the discharge of blood is the morbid product which naturally and necessarily results from that state, and may be viewed as one of the terminations of the inflammatory process. Thus, spitting of blood is very often the effect of bronchial or pulmonary inflammation or congestion; and discharge of blood from the intestines is almost constantly the effect of inflammation of the mucous membrane, as in that form of dysentery called bloody flux, or of congestion of the whole membrane, as in *melæna*. Again, spitting of blood may be, and often is, the effect of tubercular disease of the lungs, of disease of the heart, especially ossification of the mitral valve, and aetiation of the left auriculo-ventricular aperture; hemorrhage taking place in the brain is almost invariably the consequence of previous disease of its arteries; and hemorrhage from the stomach and intestines is often the effect of disease of the liver or spleen. It will afterwards appear, that scarcely any instance of hemorrhage can be justly said to be primary or idiopathic, and that every discharge of blood is the result of some previous change in the circulation of the part from which it proceeds, or some disorder in an adjoining organ.

I shall here consider, *1st*, the general phenomena of hemorrhagic diseases; and, *2dly*, the general pathology of hemorrhagic diseases.

I. SEMIOGRAPHY OF HEMORRHAGIC DISEASES.—The phenomena of hemorrhagy may be enumerated in the following order.

Hemorrhagies happen especially in what are termed plethoric habits, and to persons who are of a sanguine temperament.* They have been also said to occur principally in the young;† but this we shall have occasion to see requires considerable limitation. They are said to appear most commonly in the spring, or in the beginning of summer; but they may occur in those

* “Sanguinis eruptiones perquam familiares solent esse iis qui habitus corporis mollioris, spongiosioris, atque texturæ tenerioris sunt,—quorum vasa copioso sanguine et sero turgent, qui secundum veterum denominationem dicuntur *sanguinei*; his enim hemorrhagiae per omnem fere aetatem solennes esse solent.”—Fred. Hoffmann, *Medicin. Rational.* Tom. Quart. pars secunda. Sectio prima, p. 194.

† “Sunt haemorrhagiis ante omnia expositi promptioribus, expeditius succedentibus, frequentioribus, et fere etiam largioribus praecipue JUNIORES.” Ernest Stahl. *Theoria Vera Medica*, p. 516. Halae, 1737.

predisposed at any time, when the temperature of the atmosphere changes suddenly, either from great heat to extreme cold, or the contrary.

Discharges of blood may take place from any of the tissues of the human body which are moderately well supplied with blood-vessels. But they are greatly more common in those parts which are covered with a villous or mucous membrane than any where else. Such are the ordinary discharges of blood from the pituitary or Schneiderian membrane which lines the interior of the nostrils and nasal passages, from the mucous membrane of the mouth and throat, from the bronchial or mucous surface of the lungs, from the villous surface of the stomach or intestines, from the inner surface of the womb and Fallopian tubes in females, from that of the bladder and urethra, and even the inner surface of the kidney in both sexes.

Next to the mucous, the serous membranes are the most ordinary seat of bloody discharge. The inaccessible situation of these membranes, not communicating with any natural outlet of the human body, has manifestly rendered their hemorrhagies less known to physicians than those of the mucous membranes; and they have therefore been little noticed, and are still imperfectly understood. Morbid anatomy, however, has supplied the defects of mere practical observation; and it may be stated, as a certain conclusion from the writings of those who have collected examples of morbid dissection, that considerable effusions of blood not unfrequently take place from the pleura, the pericardium, the peritoneum, the peritoneal covering of the ovary, the vaginal coat of the testicle, and sometimes from the synovial membranes of the joints. It is further not to be doubted that the bloody effusions which occasionally happen from the arachnoid surface of the *pia mater*, or from that of the choroid plexus, and give rise to the symptoms of apoplexy, are to be referred to the same head. For a complete view of the history of the hemorrhagies of the serous, and, I may add, the synovial membranes, I refer to the Elements of Pathological Anatomy, Chapter xxiii., Section ii., p. 791. (Edin. 1828.)

The least frequent situation among membranous structures for hemorrhage has been supposed to be the skin. Yet Haller has referred to several examples of bloody discharge from this membrane. Bichat informs us that when he first came to Paris, he saw habitually along with Dessault a woman labouring un-

der uterine cancer, and who, at certain periods, had sweats which tinged her linen nearly in the same manner in which the menstrual discharge does; and Dr Duncan, Junior, observed in a young woman, in the Queensberry House Fever Hospital of this place, a periodical discharge from the skin of the face of bloody fluid, which chiefly differed from ordinary blood by containing a much smaller proportion of fibrin. Further, I conceive it is certain that the purple disease, when it affects the skin, consists chiefly in hemorrhage from the outer or cuticular surface of the corion.

Lastly, bloody discharges may take place in the substance of the solid organs. The best and most familiar example is that which may occur, and frequently does take place, in the substance of the brain, constituting apoplexy,—the *hemorrhage of the brain* (*Hemorrhagia cerebri*) of Hoffmann. For though it appears that this eminent physician overlooked the arachnoid membrane as a source of this hemorrhage, and made no distinction between blood effused on it or in the ventricles from the choroid plexus, and blood deposited in the substance of the cerebral matter, it cannot be questioned that the true source of cerebral hemorrhage, properly so called, is neither the *pia mater* nor the arachnoid membrane, but the minute vessels which pass through the substance of the brain.

Further, blood may be effused in the general cellular membrane, in the substance of muscles, in the interior of glands, and in the marrow of bones, where, if not removed by absorption, it may give rise to suppuration, or, becoming organized, it may form tumours of various characters.

The effusion of blood from any of the organic tissues above enumerated is generally preceded, accompanied, and followed by certain changes, either in the parts themselves, or in the system at large, which should be well understood by the physician.

For some time, longer or shorter in different cases, before the blood flows, there are some symptoms of fulness and tension about the parts from which the blood is to issue. In such parts as fall under view, there are redness or transient flushes, swelling or puffiness, and sense of heat or itching; and in the internal parts from which blood is to flow there is a sense of tightness, weight, and heat, with some derangement of the functions of the organ; and in both cases various pains are often felt in the neighbouring parts.

When these symptoms have continued for some time, some degree of a cold stage of fever comes on, and is succeeded by the ordinary events of the hot stage, during which the blood flows often of a florid colour, in greater or smaller quantity, and for a longer or shorter time, according to circumstances. After some time this effusion of blood ceases spontaneously; and the febrile motions are at the same time either sensibly or entirely abated.

During the hot stage, which precedes the discharge of blood, the pulse is generally frequent, quick, full, often tense or hard, and performed in that manner which gives the sensation of a double beat, (*pulsus dicrotus*, Solano de Luques); as the blood flows, the pulse becomes softer and less frequent; and if the hemorrhage ceases entirely, and the surface from which the blood issued, recovers its original condition, in the manner to be afterwards explained, it returns gradually to the same state in which it previously was during health.

In hemorrhagies taking place with circumstances noticed above, blood drawn from a vein generally, on coagulating, exhibits the crust named *buffy coat*, and is often more or less cupped, as noticed in the inflammatory diseases; but the perfection of these appearances will depend not only on the mode in which the blood is drawn, but on the period of the disease at which it is taken. In such circumstances, it is impossible to doubt that the discharge of blood is an effect of inflammation.

Hemorrhagies which arise from internal causes, or in the manner I have now mentioned, having once happened, are apt, after a certain interval, to return;—in some cases very often, and frequently at stated periods.* Such hemorrhagies have been variously named by practical authors, as *periodical*, *constitutional*, *vicarious*, or *supplementary*.

These are in general the principal phenomena which attend the occurrence of hemorrhagic diseases. But it is requisite to say, that they are not equally distinct or obvious in all cases; and very considerable hemorrhagies sometimes occur, without any of those preliminary or concomitant changes which have been mentioned being observed. Thus Stahl early remarked that hemorrhagies from the nose, the womb, the lungs even, and the kidneys, may take place without any peculiar sensation

* “Circumstantia vero negotio hæmorrhagiæ spontaneæ maxime familiaris, est peculiaris mensura STATI TEMPORIS, qua eruptio talis reverti adulescit.” Stahl, *Theoria Medica Vera*, p. 513.

either preceding or remarkably attending them; (p. 513,) and his accuracy is confirmed by the result of daily observation, which shows us, that the discharge of blood is in many instances the first indication of the existence of disease. These variations probably depend on the individual kind of hemorrhagies and some other peculiar circumstances either in the constitution of the individual, or in the part from which the blood issues, and will be more properly considered when we come to treat of particular hemorrhagies. Dr Cullen justly observed that when the febrile symptoms are indistinct or not well remarked, it merely imports that the system is more or less generally affected; and that, in some cases, there are purely topical hemorrhagies, as in others there are purely topical inflammations.

II. PATHOLOGY OF HEMORRHAGIC DISEASES.—The proximate cause of hemorrhage, like that of inflammation, has given rise among medical writers to a good deal of hypothetical conjecture mixed with fact. Among the ancients, it was almost unanimously believed to consist in what was termed a plethoric state of the system. In modern times, after the discovery of the circular motion of the blood, this doctrine was modified by the introduction of mathematical reasoning into medicine, and the application of the laws of hydraulics. As the force of the heart is always the same, it was argued, and as the areas and capacities of the vessels are always the same, if the resistance continue uniform, the blood must be propelled from the trunks with uniform force and velocity to the branches and capillaries, from which it was duly removed by the veins. If, however, from any cause, as unusual fulness of the vascular system, viz. *plethora*, compression, mechanical impediment, or obstruction, the free motion of the blood was impeded, or if by its own viscosity its mobility was diminished, accumulation took place, then over-distension, and eventually, if the vessels were feeble, effusion of blood.

These views, however, were greatly too mechanical; and in so far as they regarded the animal body as a mere machine, destitute of vital or animal powers, soon met with vigorous opposition. It is well known that the inquiry into the proximate cause of hemorrhage was one of the favourite subjects of Stahl, and even suggested to him much of that peculiar hypothesis of disease which he and his disciples, Carl, Alberti, and Junccker have so strenuously laboured to explain and inculcate.

Stahl began with denying the influence of acrimony and morbid visciduity of the blood; and he contended that plethora, though it was one cause, was not adequate to produce the phenomena of hemorrhage. Taking the menstrual discharge as an example, he inferred that hemorrhagies might take place without injury and with benefit, which if suppressed might give rise to numerous evils. He contended that there was a final cause or ultimate intention in all hemorrhagies, and that the immaterial soul, which was conscious of this intention, and of the circumstances which rendered it necessary, directed the motions of the material vessels in such manner as to produce the discharge necessary. Lastly, he thought that the instrumental causes or means, which the immaterial soul thus employs to produce the very act of hemorrhage, are increased *tonic motions*, neither obstruction of vessels nor erosion, but an increased degree of the tonic motions, by which the blood is impelled or forcibly conveyed to those parts from which it may conveniently escape.* To this peculiar increased energy of the tonic motions, the language of the Stahlian school applied the name of *hemorrhagic effort*, (*Molimen haemorrhagicum.*)

Of this doctrine, the only point which can be said to be borne out by observation is, that the vessels of the part from which blood is to issue are unusually and inordinately distended. The rest is mere conjecture and fancy.

It is in the works of Frederic Hoffmann that we find the most probable approach to the truth on this subject. After laying down several very distinct aphoristical propositions, founded on practical observation, he concludes that hemorrhagies, in whatever part they take place, proceed neither from abundance of blood, nor from its excessive turgescence attempting a passage through the vessels, nor from acrimony of serum and blood giving rise to *diæresis*, nor from extreme tenuity leading it to escape by vascular pores; but rather from its being turned or moved towards particular parts, and from an unequal or irregular distribution. This irregular distribution he believed to take place, when certain parts at a distance from the heart un-

* “Causae instrumentales ad producendum ipsum actum haemorrhagiæ sunt *motus tonici* auctiores; quibus sanguis tum in illam regionem latius, tum magis privatim, ad immediatum locum exitus ita constringitur, ut ibi distensione vasorum, et denique orificiorum extremorum, per modum talem *expansionis* exitus ita obtineatur.” *Theoria Med. Vera*, p. 526.

derwent such contraction from intense stricture of fibres, that the blood could not return by the veins, in consequence of which the lateral vessels of the arteries, which generally contain not blood, but only a thin lymphatic fluid, are unnaturally distended, and must be at length opened.*

The observations and reasonings of this judicious practical physician evidently led Dr Cullen to the formation of that theory, which, with all its faults, is perhaps the truest and most perfect piece of pathological reasoning in his whole works. That it is entirely free from objection, or that it will explain all the phenomena of hemorrhagic diseases, cannot be asserted; but it may justly be pronounced, even in the present day, to be the most faultless and least exceptionable that has yet appeared. M. Pinel has indeed in his *Nosography* asserted, that Dr Cullen has made his doctrine on the hemorrhagic diseases consist almost entirely of subtle theories and explanations of different symptoms; and declares that he means, by adhering rigorously to the history of facts, to show the bad taste of the vain and frivolous load of hypothetical explanations which Cullen lavished on his researches on the proximate cause of hemorrhage.† But though I respect the learning and talent of this physician, I know not how to reconcile his assertion, with the matter of Cullen's doctrines on hemorrhage, which contain perhaps fewer opinions than any other work on medicine which could be mentioned, and which are actually more truly descriptive, by a great deal, than M. Pinel's own work. It may be doubted whether M. Pinel had studied them very carefully, especially when he asserts that Cullen says nothing of the passive hemorrhagies, which every one acquainted with the *First Lines* must know to be false.‡

In delivering the pathology of hemorrhagy, Dr Cullen had several objects in view. He first attempted to explain the process by which blood is effused in the living body from a certain order of vessels. This he did by showing that there was some inequality of distribution in the blood, in consequence of which a greater quantity is poured into certain vessels, that is, the capillaries, coloured and colourless, than their

* *Medicinae Rationalis System.* Tom. 4ta, Pars secunda, Sectio prima, §. x. p. 195.

† *Nosographie Philosophique*, Tome ii. p. 583, and p. 577, note.

‡ *Ibid.* Tom. ii. p. 577.

natural and healthy capacity is suited to receive; and that the effect of this distension was to open or rupture the ultimate extremities of these vessels, and thus produce an effusion of red blood. As this, however, was insufficient to explain the other phenomena attendant on this process, such as the peculiar state of the blood and the vascular system in general, he had recourse to the usual supposition of the operation of the *vis medicatrix*; which, in consequence of the congestion existing in such circumstances, formed a cold stage and subsequently a hot one, during which the vessels, as it were, made an effort to discharge some of the blood with which they had been preternaturally distended.

In this view of the pathology of hemorrhagy, it is manifest, that the first part is nothing more than the expression of the mere simple state of the capillary vessels, which are the immediate seat of the disease; and that the second part of it, which relates to the formation of fever, is faulty only in giving a name to that property by which the vessels give way and expel the blood, or in supposing a power which enabled the vessels, in certain circumstances, to act in this manner. This property may or may not exist. The effect is certain; but the agent or cause by which it is accompanied is unknown, and entirely eludes observation.

The third object which Cullen had in view was to explain the frequent recurrence of hemorrhage after it had once taken place. To this effect he thought two circumstances especially concurred. The first was the relaxation of the vessels already emptied by the first hemorrhage, and the readiness with which they were filled, while the original hemorrhagic causes continued to operate. The second was the plethoric state of the system, which he conceived the hemorrhage to indicate, or sometimes to produce. To prove that the last is a powerful and actual cause of *plethora*, Cullen employs a good deal of reasoning, which, though not susceptible of exact or mathematical demonstration, is yet extremely probable, and is unquestionably connected with the fact itself, that discharges of blood, either artificial or spontaneous, have, in certain circumstances, a powerful influence in inducing, if not *plethora*, at least congestion and unequal distribution of blood. (748.)

On these principles, Dr Cullen conceived that it was possible to explain the phenomena of hemorrhagic diseases as oc-

curring under all circumstances, and incident to persons of every age, and in any part of the body.

But a fourth object of his pathology of hemorrhage was to show why hemorrhages occur in certain parts of the body and at particular periods of life, and to explain the circumstances which give rise to these peculiarities. The fact had been originally noticed in ancient times by Hippocrates, that discharges of blood from particular regions of the body were peculiar to certain ages;* and it has been repeated by almost every physician from his time to that of Hoffmann and Cullen. "Boys and youths," says the former, "are chiefly subject to discharge of blood from the nose; in young men it attempts to escape rather by the vessels of the lungs, whence spitting of blood is most familiar to this age; in men and those of established or middle age the blood tries to escape by the veins of the rectum; and in decrepit age by the urinary passages."

Though it would not be difficult to find objections to this as a general proposition, yet, upon the whole, there is sufficient proof, that, within certain limits, it is well founded. Admitting it, therefore, as a fact, it was not without reason that it attracted the attention of Cullen, who, with great ingenuity, applied the general principles of the physiology of the circulation, and of the relative influence of the arterial and of the venous system in the growth and decrement of the body at different periods of life, to account for the respective predominance of different hemorrhagies at these periods. The only and the greatest objection which is to be urged against this part of the Cullenian theory was overlooked by Pinel. The explanation is not pathological but physiological, and therefore ought to be referred rather to the head of predisposing causes, and the manner in which they operate, than to the actual pathology of the disease. Thus it must be admitted to be a physiological principle, established on numerous facts, that the growth of the head and face, previous to, and about the time of puberty, is attended with a very considerable determination, as it is named, of blood through the arteries of the head and face. In like manner it is generally believed, that, between the ages of fifteen and five-and-twenty, while the body is attaining its great-

* Τοῖσι δὲ ἐπὶ πρεσβυτεροῖσι καὶ πρὸς ἥξην προσάγουσι—ἐκ ρινῶν αἱματος ρυσιες. Τοῖσι δὲ νεανίσκοισιν αἱματος πτυσιες. Τοῖσι δὲ ὑπὲρ τὴν ἡλικίην ταυτὴν—ληθαργοὶ—αἰμορροῖδες. Aphorismaton, sectio iii. 27, 29, 30.

est size and vigour, the developement of the lungs and of the pulmonary vessels is attended with a great flow of blood to these organs. But the first of these processes is not always or necessarily attended with discharges of blood from the nose; nor is the second in all persons accompanied with discharge of blood from the lungs. It is only when they are deranged by the concurrence of certain circumstances, that these results take place; and the great number of the human race, who pass through the periods of youth, puberty, and adolescence without suffering such effects, demonstrates clearly the fact, that the process of growth, with its respective determinations, is to be regarded as a predisponent circumstance only.

The same views must be taken of the alleged determinations of manhood and old age. In the former period the veins of the rectum may be loaded, and in the latter those of the brain may be unusually distended; but whether they will be so in sufficient degree to cause either the hemorrhoidal discharge or cerebral effusion and apoplexy, will depend upon causes much more direct and specific in their operation, than those which arise from imperfect return of the venous blood. The theory of the predominance of arterial and venous *plethora*, therefore, is of no other use in explaining the proper pathology of hemorrhagy, than as it suggests a convenient predisponent cause, which may or may not operate in increasing the power of other circumstances more immediately connected with the process of hemorrhagy.

I shall afterwards point out what I conceive to be a more satisfactory mode of explaining these phenomena.

Since the time of Cullen, though several works have been composed on the subject, not a great deal has been done to elucidate the pathology of hemorrhagic diseases. But in the general progress of pathological research, several points have come under notice; and these, with illustrations derived from the facts of morbid anatomy, may perhaps tend to place the certain and uncertain parts of the subject more clearly before us than they have hitherto been. The pathology of hemorrhagy involves the following points.

When parts which, in the living body, have been the seat of hemorrhage are examined after death, the appearances presented vary according to the interval which has elapsed since the effusion of blood. If death have taken place shortly after the effusion of blood, then the part is generally found covered

more or less with fluid or semifluid blood, upon the removal of which the membrane or surface or substance is found more or less reddened, and, in general, effusing blood from various points, so minute as to be imperceptible by the naked eye. The blood is said then to be exhaled from the surface of the membrane. It is very unusual to discover in the surface of the membrane any change like erosion, or any thing like the aperture of a large vessel; and all these discharges of blood, which proceed from the surface of the different mucous membranes, are known to take place in the manner now mentioned, or by what is termed exhalation or exudation. Such is known to be the case with the bronchial membrane, the pharyngeal, oral, and nasal membrane, the gastric mucous membrane, the intestinal mucous membrane, and the interior surface of the uterus and the vagina.

In those cases in which a considerable interval has elapsed between the occurrence of the hemorrhage and death, and especially if the hemorrhage have recurred several times, appearances slightly different are recognized. These are of two kinds. *1st*, The whole membrane is red or brown-coloured, rough, and sometimes irregular, more or less loaded with blood and blood-vessels, thick and heavy, and in general it is friable, lacerable, and void of its usual elasticity; *2d*, The subjacent tissue, whether cellular or muscular, is also much loaded with blood of a dark-brown colour, within vessels and out of them; and the vessels are numerous, large, and distended. These appearances are most usually seen in the colon when it has been the seat of hemorrhage.

In the solid, parenchymatous, or compound organs, other appearances are sometimes found. Thus in the lungs masses are found, from the size of a filbert to that of the fist almost, of a dark-brown colour, firm, hard, inelastic, friable, and lacerable. In some instances, the portions thus darkened are not perfectly firm or inelastic, but are firmer than the neighbouring portion of lung, and when divided present a granular aspect, which is evidently produced by the extravasation of blood into the proper filamentous tissue of the lung. The vessels are filled to distension with brown-coloured coagulated blood; and the whole portion so changed, though firmer and less elastic than sound lung, is friable and lacerable.

Though this state of lung may take place in consequence of disease of the lung itself, yet most usually it is the consequence

of disease of the mitral valve, that is, ossification of the valve and arctation of its aperture.

A lung in this state is said to be affected with hemoptysical engorgement or pulmonary apoplexy. The former is a better name than the latter, which is applied to the lung from a false analogy between its state and that state of the brain which gives rise to symptoms of apoplexy. The error here consists in applying a semiographic denomination to a pathological state of another organ, in which no symptom of the kind intended to be understood takes place. The name hemorrhagic peripneumony, or simply hemorrhagic infiltration, would be much more appropriate.

The prostate gland is liable to hemorrhage; and when blood is effused from it, it is found that the veins of the gland are much enlarged and greatly distended with blood. These veins are generally varicose.

These facts, and others which shall be mentioned in the course of the history of individual hemorrhagies, are sufficient to establish the accuracy of the following conclusions.

1. Every effusion of blood of the kind now specified takes place in general not from one or two large vessels, but from numerous small or capillary vessels, all of which are previously the seat of much distension, of congestion, and are filled with blood, which moves very slowly, and at length remains almost motionless, until the effusion of blood takes place.

2. From these overloaded vessels the blood is effused, and, escaping into the surrounding filamentous tissue, fills its interstices and there undergoes coagulation. In this manner, it gives the part not only its dark-brown colour and granular aspect, but the peculiar firm inelastic feeling, and at length renders it friable and lacerable,—destroying at the same time the characteristic structure, and impeding the functions of circulation and the proper functions of the tissue.

3. A part thus affected with what may be called hemorrhagic congestion, infiltration, and induration is greatly changed from its normal structure. This change in structure, however, is not the cause but the effect of the hemorrhage. It is the consequence of the preliminary congestion with which the capillaries of the part are affected; and it is not the cause of the effusion of blood, but a simultaneous effect with that of the capillary congestion. These changes have been also represented to be the anatomical characters of hemorrhage. This, how-

ever, is also a mistake. They are, properly speaking, the anatomical characters of the effects of hemorrhage, or hemorrhagic congestion, or the physical changes induced by the effusion of blood into the interstitial tissue of the parts.

4. Great as is the change in structure now mentioned, there is reason to believe that it is often, under favourable circumstances, more or less completely removed. If it be not very extensive, and if proper means be seasonably adopted to prevent it from continuing or increasing, the blood after being effused may be absorbed, or, at least, it disappears; and the circulation and other functions of the part are gradually restored, while the structure returns nearly to its natural state. In other instances the part remains more or less firm, granular, friable, and inelastic, and is liable either to be broken down in a peculiar species of softening; or it lays the foundation for other derangements in the circulation of the part, and fresh attacks of hemorrhagic congestion and extravasation. When an organ like the lung has thus become much solidified, it sometimes terminates in gangrene or softening, and sometimes in dropsical infiltration.

5. It next becomes an interesting point of inquiry to ask wherein does hemorrhagic congestion differ from inflammatory injection? This question it is not easy to answer. But various facts and considerations deserve attention, and may throw some light on it. There seems to be no doubt that inflammatory injection is very similar to hemorrhagic congestion, and the former often terminates in the latter. On the other hand, it is rare for hemorrhagic congestion to terminate in any of the usual terminations of inflammation, excepting the brown hepatization in the case of the lungs. It is unsafe to have recourse to conjecture in the absence of facts, or to give explanations where all the facts are not ascertained; but were it allowable to employ such a method in regard to the present subject, I would say that the congestion in the capillary system leading to hemorrhage being so great, so intense, and so sudden, that it bursts the vessels, as it were, before any of the inflammatory products can be formed, is the chief circumstance which distinguishes hemorrhagic from inflammatory congestion.

6. The effusion of blood from the vessels must be regarded as the method employed by nature to relieve them of the unnatural and excessive load by which they are distended. If the blood escape so as to be conveyed out of the system altogether,

the vessels speedily contract on the residue, and begin to propel it in its proper direction. Coagulation at the same time takes place, and the vessels from which the blood escaped are closed.

7. In some instances, even where there is hemorrhagic congestion, the effusion may not take place, in consequence of the occurrence of symptoms requiring the prompt employment of remedies. Thus in threatening hemorrhage from the lungs, indicated by cough, tightness, oppression, and short breathing, if blood be drawn from the arm so as to relieve the symptoms of oppression of the lungs, no hœmoptysis takes place.

8. It is important to observe, that the symptoms of venous plethora, to which Cullen attached so much importance in his explanation of the phenomena of hemorrhagy, if ever they really exist to the extent imagined by him, are to be referred to a head altogether different, and certainly more specific. These symptoms of venous plethora are dependent either on a diseased state of the heart or its valves, especially the mitral or aortic valves, or to a diseased state of various arteries, especially those of the brain. These are evidently the true causes of the excessive fulness and distension of the venous system, and the reasons why the blood is prevented from flowing through the veins with the normal velocity. I do not deny altogether the fact of undue fulness of the veins; but when it is difficult to perceive how these vessels are inordinately loaded and distended, unless by the impediment furnished by the state of the heart and its valves to the motion of the blood from the veins, and the constant fulness induced in the lungs and the cerebral veins by that impediment, it is surely more rational to refer the phenomenon to a specific cause, the effect of which can be easily understood, than to a vague supposition, which may or may not exist, and which, if it do exist, is merely secondary.

9. Regarding the influence of disease of the arteries, it is matter of fact, that when these vessels, especially if small, become opaque, friable, rigid, and inelastic, they do not promote the motion of the blood through them so easily and effectually as in the healthy state. The blood is therefore accumulated within them, and distends them in a greater degree than natural; and, as they no longer possess the same powers of resistance, it is natural to suppose that they may often give way. This fact, which was first shown to be very frequent in the brains of apoplectic persons by Morgagni and Lieutaud, has

been fully confirmed by the researches of Baillie* and Hodgson† in this country, and Bouillaud‡ and Serres§ in France. The particulars will more properly form the subject of consideration, when I treat of apoplexy and palsy.

10. There is nevertheless one variety of deranged circulation taking place most usually at or after a certain age, which, so far as has been hitherto ascertained, more justly deserves to be referred to the head of venous plethora. This consists in a particular state of the abdominal, and perhaps the hepatic circulation. It has been long observed, that after the age of thirty-five or forty, in persons, especially, who are indolent and neglect regular exercise, and who still continue to eat and drink to the same amount that they did in early life, various symptoms of plethora in the abdominal viscera begin to appear. Thus not only do such persons feel unusual distension and fulness of the abdomen, especially the epigastric and umbilical regions, but they feel that this fulness prevents the free motion of the diaphragm, and consequently impedes respiration. Constipation becomes obstinate and habitual, and gives rise to much greater uneasiness and more serious symptoms than formerly. In different individuals it produces attacks of violent headach, more or less loss of appetite, flatulence, and various dyspeptic symptoms, and on some occasions discharges of blood from the rectum, with or without attacks of painful swelling at the lower end of that bowel. In some instances attacks of diarrhœa take place; and as these are in general followed by the temporary disappearance of headach, *anorexia*, and other uneasy sensations, there is every reason to regard the diarrhœa which takes place in this manner as a salutary attempt of the textures and their vessels, or what is sometimes denominated an effect of the *vis medicatrix naturæ*. The symptoms produced by this state are often those of latent or anomalous gout. But to whatever complaints or symptoms they give rise, it is scarcely possible to doubt that the state consists in an unwonted accumulation of blood in the capillary vessels of the mesenteric arteries, in the mesenteric veins, and in the hepatic veins, or the trunk and branches of the *vena portæ*. Such persons are often corpulent, or

* Morbid Anatomy, Chapter xxiv. *apud* Works, Vol. ii. p. 393.

† Diseases of Arteries and Veins, p. 26, p. 76.

‡ Recherches tendantes à prouver, &c. *Memoires de Societé Medicale d'Emulation*, Vol. ix. Paris, 1826, p. 147.

§ Observations sur le Rupture, &c. *apud* Journal de Physiologie Experimentale et Pathologique, Tome vi. p. 82. Paris, 1826.

have the belly somewhat tumid. But the same symptoms may take place in the meagre. In general hemorrhoidal attacks are apt to take place at particular seasons, and sometimes these alternate with attacks of violent oppressive headach, passing rapidly to a state of stupor, and which, if not opposed by timely depletion and the use of cathartics, terminates in coma or a paralytic attack.

11. The symptoms and conditions now specified indicate more decidedly, perhaps than most others, a degree of unwonted and preternatural fulness of the abdominal veins. It is quite possible that there is resistance to the return of the venous blood, either in the liver or in the lungs and right side of the heart; and this constitutes the difficulty in deciding whether, in any given case, the chief cause of impeded circulation and consequent congestion be in the heart, as already shown, or in the liver. If it be in the former organ, then the morbid condition refers itself to that head. If in the latter it refers itself to the present. Often fulness, tension, and uneasiness may be recognized in the right hypochondriac region; and in various instances, after the disease has continued long, it terminates in dropsy with jaundice.

12. The facts now specified enable us to explain a circumstance remarked by many physicians, and which has always hitherto been either imperfectly understood, or wholly mistaken. It has been long observed among physicians, that hemorrhages are liable to terminate in dropsies; and the fact has been converted into a sort of aphorism by Sydenham, who was wont to say, "*ubi hemorrhagia desinit ibi hydrops incipit.*" It has been further observed, that various instances of dropsy which resisted all remedies, spontaneously disappeared after copious hemorrhage. The true explanation of these facts is found in the circumstance, that hemorrhage and dropsy are neither of them primary diseases, but are both common symptoms and effects of the same disorder. Thus disease of the heart may give rise to hœmoptysis and to dropsical effusion. If it produce the former, it sometimes prevents the latter from taking place. But I have seen hemorrhage from the lungs take place at the same time, and in the same person, with dropsical infiltration, in consequence of the same primary cause, viz. disease of the heart, sufficient to interfere with the natural motion of the blood through the organ. The hemorrhage, therefore, does not, as is often maintained, produce the dropsy; but both proceed from the same general cause. Dr Parry men-

tions instances in which profuse hemorrhage from the lungs removed at once dropsy, with symptoms of disease of the heart; and most practical physicians must have observed cases of dropsy dependent on disease of the heart, in which the occurrence of hemorrhage obliged them to have recourse to depletion, and very generally with benefit.

The same views are applicable to hepato-enteric congestion and hemorrhage, or abdominal dropsy. The suppression of bleeding hemorrhoids has often been observed to be followed either by disorder of the brain, and palsy, or ascites; and the hemorrhage from the intestines should doubtless be viewed as a means employed by nature to diminish the hurtful plethora, and continue the healthy action of the organs.

15. These observations lead to the general conclusion, that the vascular system is liable to a state of plethora or congestion, or excessive distension, which is liable to terminate in either effusion of red blood, or the effusion of the serous or sero-albuminous part of the blood; and that either of these two terminations are capable of relieving the vessels of the unusual quantity of blood by which they are distended.

16. I have already adverted to the fact, that in inflammatory hemorrhage, as it may be named, the blood drawn from a vein presents a thick buffy coat, which is also in general more or less, sometimes very much cupped. In this case the serum is in general abundant, and amounts upon an average to one-half nearly of the quantity of blood drawn. There are, however, hemorrhagic diseases in which the blood presents different appearances, and instead of the buffy coat, and a considerable proportion of serum, it is free from buff, and presents either a small proportion of serum or none at all. This circumstance of scanty serum is mostly observed in those hemorrhagic diseases in which purple or logwood coloured spots appear on the skin, and blood flows from the different mucous membranes. In a case of this kind, that is purpura, in which the symptoms suggested the propriety of drawing blood from the system, I have seen a quantity of twelve ounces totally void of serum twenty-four hours after the blood was drawn; and in other cases, I have seen not above one drachm of serum at the end of the same interval. This circumstance might be imagined to indicate the want of serum altogether; but this it does not. It merely denotes that the coagulating power of the blood, which always shows itself when it is exposed to the air and allowed to rest, is greatly diminish-

ed. The serum is separated in ordinary circumstances by the strongly contracting power of the coagulum, or rather the coagulating part of the blood ; and as this is firm and tough, the serum is abundant. In the cases of the kind now mentioned, the serum is retained with the clot, and is not separated from it in consequence of impaired coagulating power. The clot itself is loose, soft, and tremulous, firm at the surface, where it has been freely exposed to air, but loose and soft in the centre, to which air has not had access.

It is quite possible that this impaired coagulating power, which the blood possesses in the healthy state, may be partly the cause of the hemorrhagy ; but on this point we have very few satisfactory or positive facts. It is known that, in certain forms of hemorrhagy taking place in certain individuals, the blood discharged either does not coagulate at all, or does so very imperfectly ; and in these persons it is not unreasonable to infer that one principal cause of hemorrhage is preternatural thinness or tenuity of the blood, or diminished coagulating power, (*απνηξίς*.) In such persons it is observed that a very slight wound either of the skin or the mucous surfaces, or an insignificant scratch, is followed by profuse and continued hemorrhage, which it is often difficult to repress, and, in some instances, such hemorrhagies have continued to the fatal event. Thus, the extraction of a tooth has been known to be followed by hemorrhage so profuse and enduring, that great feebleness and exhaustion, and, in some instances, death has ensued. In the whole of this class of cases it is observed that the blood either does not coagulate at all, or does not coagulate with sufficient firmness to close the bleeding parts.

This peculiar disposition, which has been sometimes named, not very properly, the hemorrhagic *diathesis*, is most commonly hereditary, and dependent on family peculiarities,—several individuals in the same family evincing the disposition by various hemorrhagic discharges, in consequence of very slight accidents.* But it seems also capable of being induced by various causes ; as previous disease, low diet, the strumous habit, or strumous diseases in general, and, perhaps, previous hemorrhagies. In some instances the diathesis is evinced by the readiness with which ecchymosis is produced, in consequence of very moderate injuries. I knew an individual in whom a slight scratch,

* Otto, Account of an Hemorrhagic Disposition existing in certain Families.—*Med. and Phys. Journ. for 1806*, Vol. xx. p. 69. See also Vol. xxxiii. p. 9.

or the pressure of the weight of the person on particular points, was wont, at certain periods, to be followed by the formation of large livid patches and *vibices*, evidently the result of cutaneous or subcutaneous hemorrhage.

It is not improbable that the hemorrhagies taking place in scurvy are produced somewhat in this manner. But upon that point I shall have occasion to speak afterwards.

III. GENERAL ETIOLOGY OF HEMORRHAGIES.—This I have already in some degree anticipated. If we divide the remote causes into predisponent and exciting, we find that many of the former refer themselves to various morbid states of the system, or of particular organs. Thus, the disposition to pulmonary hemorrhage may depend upon the presence of tubercular disease of the lungs, or disease of the heart, or peripneumony, or chronic bronchial disease. The disposition to hemorrhage in the brain is almost constantly the result of disease of the cerebral arteries. The disposition to intestinal hemorrhage is the consequence either of disease of the intestinal mucous membrane or of disease of the liver.

Among exciting causes must be mentioned great external cold or heat, or the sudden transition from the one to the other; falls, blows, or other injuries in which the trunk or any of its parts is wrenched or sustains concussion; over-exertion of any organ, especially the organ disposed to hemorrhage; ascending mountains or great heights, where the atmosphere diminishes in density; the presence of febrile or inflammatory disorders; and, in general, all those causes which derange, subvert, or retard the motion of the blood in the blood-vessels.

IV. GENERAL THERAPEUTICS OF HEMORRHAGIES.—If the principles already announced be well established, it results that hemorrhage being a symptom and effect, the treatment must be adapted to the primary disease on which it depends. Thus, in inflammatory hemorrhage, the antiphlogistic regimen must be adopted. When the discharge depends on the presence of other diseases they, if curable, ought to be first treated; and, if not removable by the means of art, measures should be adopted to counteract and obviate their effects. Hemorrhage, however, is itself often a sort of natural cure; and the chief duty of the physician is to see that, if possible, it do no injury to important organs. The particular methods by which this must be accomplished will be most conveniently specified under the respective heads of the individual hemorrhagic diseases.

CHAPTER I.

HEMORRHAGIES OF THE MUCOUS MEMBRANES AND THE
CONNECTED ORGANS.

§. I. Bleeding at the Nose. *Epistaxis*. *Hæmorrhagia Narium*, Hoffmann. *Rhinorrhagia*. *Hæmorrhagia*, Sauvages, gen. 239. *Hæmorrhagia plethorica*. *Saignement du Nez*. Gall. Nasenbluten, Germ. Krwotok z nosa, Polon.

Blood is liable to issue from the mucous membrane of the nostrils in particular circumstances; and to every discharge of blood of this kind, if considerable, the general name of *Epistaxis*, which means destillation, has been applied.

Of epistaxis three kinds may be distinguished; the *first*, that which takes place in youth, and which is often an indication and effect of unusual determination to the head and nasal mucous membrane; the *second*, that which takes place in adult or old age, and which is always an indication of much congestion in the brain and its vessels; and the *third* is a species of hemorrhage which is the effect either of polypous tumour in the nostrils, or of ulceration of the nasal mucous membrane, and sometimes of the fibro-mucous membrane covering the delicate bones which enter into the formation of the several nasal cavities.

I. The ordinary *epistaxis* of young persons is usually preceded by feelings of weight, tension, uneasiness, or pains in the forehead and about the glabellar region. In some instances it is the effect of *coryza*, and it terminates the symptoms of the disease; and many cases of *coryza* or catarrh disappear under the escape of a few drops of blood from the nostrils several successive mornings. When the discharge is more profuse, however, which may be, and often is the case, it is generally preceded for several days by frontal and coronal headach, more or less severe and obstinate, flushes of the face, especially in the evening and after meals, constipation, and a pulse varying from 88 to 96 or 100, and always easily accelerable. In general the attack is immediately preceded by sensations of cold or chills, which make the patient seek the fire; and, shortly after, he complains of hot sensations in the head, cheeks, and face, and a sense of tickling within the nostrils, and very soon, either

without blowing the nose or after that operation, blood is discharged more or less copiously, and continues for a longer or shorter time.

As the discharge of blood continues, the pain and weight of the forehead and coronal region abate or altogether disappear; the pulse becomes less frequent and the face more pale; and in some instances there is an approach to faintness. At this time the hemorrhage usually ceases spontaneously. But it is liable to return as soon as the patient becomes warm or heated, when he coughs or sneezes, or when the air of the apartment is much heated.

Hemorrhage taking place in young persons otherwise healthy is not a dangerous disorder, and is merely to be looked on as an indication of plethora, or the effect of constipation or slight feverishness from cold. It is in general, therefore, to be viewed as the cure of the condition by which it was induced. It is always desirable, nevertheless, to exhibit laxative medicines, in order to diminish plethora and congestion about the head. In more serious cases, in which the hemorrhage is profuse and repeatedly recurs, it becomes requisite to adopt more decided measures. The patient should be kept in cool air, and in the erect position; the head and face ought to be kept quite cool by removing all coverings, and washing the head, face, and neck, with cold water; and all local irritation ought to be avoided.

A popular remedy for suppressing bleeding at the nostrils is the application of a key or a piece of cold iron at the back of the neck; and it often seems to be effectual in stopping the bleeding. Concerning the mode in which this remedy operates, it is idle to speculate, unless we were always assured of the fact. Cold applied to the cervical region can have little effect in diminishing the current of blood through the vertebral arteries; and suppose it had much effect, the circumstance would not account for the cessation of the hemorrhage. It is most probable that the cold acts either by nervous sympathy, propagated from the skin to the nasal mucous membrane, or by the general astringent effect which it exercises on all the vessels of the region of the head and neck. In the application of the key there can be no specific virtue; and the full effect may be obtained by applying cold cloths or ice to the neck or to the face, or by pouring cold water on the head and face. This I have

found a convenient and effectual remedy in many instances of nasal hemorrhage.

The use of laxatives, or even cathartics, is important; and moderation in the use of food and drink is indispensable.

II. The second variety of nasal hemorrhage is that which takes place in adults and aged persons, in connection almost invariably with symptoms of diseased circulation within the head, or, as also may happen, with symptoms of disease of the heart. The discharge is preceded by a sense of weight and confusion in the head, sometimes ringing in the ears, and imperfect vision or luminous corruscations in the eyes; slow and torpid bowels, yet without marks of impaired appetite; and with coldness of the feet. In other instances, bleeding from the nostrils takes place, and proceeds to a great extent without being preceded by any unwonted or disagreeable sensations about the head.

The discharge comes on in the evening or during the night, and flows profusely until two or three pounds of blood, mostly venous, have been lost. In general some means are adopted to arrest the bleeding, as washing the face with cold water, the application of cold cloths, and similar means; and the hemorrhage ceases either in consequence of the use of these measures, or spontaneously.

Often, however, it is exceeding difficult to be checked; and it proceeds to a very great extent, for instance five or six pounds, without showing any appearance of ceasing; and in such circumstances it is requisite to have recourse to decided measures for preventing it from proceeding farther.

Epistaxis occurring under the circumstances mentioned, though not itself a dangerous disorder, is nevertheless the indication of a morbid state of the circulation either of the heart or of the cerebral arteries. Its occurrence in general shows that the venous blood must have encountered some serious impediment in its return from the brain; and this impediment may be seated either in the lungs or the heart, or in the liver or spleen; or it may be produced also by a morbid state of the cerebral arteries. Under such circumstances it acts as the cure of the disorder of which it is the effect; and, therefore, when moderate, it is not requisite to employ any very decided means for arresting it. It is requisite, nevertheless, to employ those measures calculated to prevent its occurrence, or, in other words, to remove if possible the cause on which the hemorrhage depends. This is to be attempted by the employment

of the antiphlogistic regimen, keeping the bowels free from constipation, and if there be not sufficient depletion from the occipital region by cupping, and from the system by venesection.

When hemorrhage actually takes place, and proceeds to a great extent, it becomes requisite to employ promptly the means of suppressing it. These consist in the application of cold not only externally, but within the nostrils, by injection. It often happens, however, that all the usual means are ineffectual; and it becomes requisite to plug the nostrils, or to compress them, so as to favour coagulation and suppress the hemorrhage. The usual method of plugging is to carry a bit of sponge or charpie, with a cord attached to it, from the posterior fauces through the nostrils by means of a cannula. I have found, however, few patients who could endure the uneasiness and irritation produced by this mode of suppressing nasal hemorrhage; and I have found it a much more agreeable method, and quite as effectual, to introduce through the anterior nasal openings, plugs of charpie, with silk threads attached to them, and to compress for some little time, but very gently, the upper part of the nostrils by the fingers. This method has the full effect in most cases of favouring coagulation, and thereby stopping the flow of blood.

III. A third variety of nasal hemorrhage is altogether symptomatic of, and dependent on, disease of the nasal mucous membrane. In persons who have been subjected to the influence of repeated courses of mercury, the fibro-mucous membranes covering the nasal bones, the superior and inferior spongy bones, the lacrymal bones, the palate bones, and the delicate parts of the superior maxillary bones, are liable to be attacked with inflammation, which terminates most commonly in ulceration of the membrane, and caries, or even death of the bones. In the course of this process, blood-vessels are occasionally involved in the ulcerative process; and the result is hemorrhage, often to a great extent, but always recurring several times. This variety of epistaxis is easily known by the history of the case, and the kind of patients in whom it takes place.

The prognosis is not favourable; for the discharge is liable to recur so often as to enfeeble the patient in a remarkable degree; while the inflammatory and ulcerative disorder on which it depends, proceeds and destroys successively many of the bones of the nasal cavities. It is often associated with, or pre-

ceded by, a bad *ozæna*, or fetid puriform discharge from the nostrils.

In attempting to suppress hemorrhage of this nature the same means may be used as are noticed in the others; though they are in general much less effectual.

In this form of hemorrhage the topical application of astringent substances is often advantageous. With this view alone, blue vitriol or white vitriol, either in solution, or in powder, may be applied to the inner surface of the nostrils, from which the blood is supposed to issue. A piece of charpie soaked in either of these solutions is to be thrust up the nostrils by means of a probe; or if the point can be either seen or correctly reached, they may be applied in substance, or the part may be freely touched with lunar caustic. Lastly, if, after the use of these means, after proper examination, and the disappearance of all pain of the head, blood continues to flow from the nostrils, a piece of sponge or soft charpie, soaked in a solution of blue vitriol, is to be drawn, by means of a cord attached to it, from the posterior *fauces* into the nostrils, and to be kept there till the hemorrhage ceases.

§. II. Spitting of Blood; Expectoration of Blood; Coughing of Blood. *Sanguinis sputum. Cruenta Expuitio. Hæmoptysis*, Sauvages and Cullen. *Hæmoptoe. Pneumonorrhagia*, Jos. Frank. *Hæmoptysie; crachement de sang. Flux sanguin des poudrons*, Gall. *Emoftisi; Emotisia; Sputo di Sangue*, Ital. *Escupir sangre; arrojo de sangre; salivacion de sangre*; Hisp. *Cuspo de sangue; Escarro de sangue*, Lusit. *Blutspeyen; Bluthusten; Lungen-Blutfluss; Lungen-Blutung*, Germ. *Blodspyting*, Dan. *Blodspottning; Blodhostung*, Suec. *Krwia plucie*, Pol. et Slav.

SEMIOGRAPHY.—When, after a fit of coughing, either slight or severe, a quantity of pure florid or red-coloured blood, in general frothy, is brought up into the mouth and spit out, the disorder is denominated Spitting of Blood, or *Hæmoptysis*; and as the blood is conceived to proceed from the lungs it is sometimes denominated Hemorrhage of the Lungs (*Hemorhagia pulmonum*); and sometimes *Pneumonorrhagia*.

Hemorrhage from the lungs is very generally preceded by various symptoms of disorder in the functions of these organs.

In general cough is frequent and troublesome, sometimes short and dry, very rarely moist. In some instances, also, the breathing is a little more short and frequent than natural, and a sense of oppression is felt at certain times in some part of the breast.

In the majority of cases these symptoms attract little attention, and are regarded as the effects of common cold. At length, however, the patient begins to feel languid, oppressed, and drowsy, yet sleeps badly during the night, and is disturbed by fearful dreams; he feels chill during the day, or has slight shivering sensations; while the cheeks and palms are hot, and the face is a little flushed, but the extremities cold. The digestion is sometimes disturbed, the appetite impaired, with flatulence and distension of the belly, and slow bowels, or great constipation. The pulse, if examined, is found quicker than natural, full, and rather tense if the patient be warm, small, but still tense if he be cool; and he may have palpitation, with more or less increased cardiac impulse.

The several symptoms now mentioned continue for some time little changed and not much aggravated. At length the patient, most frequently during the night, is attacked with a peculiar sense of tickling in the throat, which irresistibly impels him to cough; and, indeed, the cough is incapable of being restrained; and as the cough proceeds he feels brought up into the throat and mouth a saltish fluid, which at once, from the quantity and taste, he knows to be blood, and which, when a light is brought, he finds to be blood. One mouthful is succeeded by another, until sometimes a teacupful is thus rejected from the windpipe, often with a feeling of impending suffocation, until it is excreted, but always with relief after it is coughed up.

In other instances, the first attack takes place during one or more attempts to run up stairs, or ascend an acclivity; and it recurs, as often as the individual makes any sudden or great effort of his person, or of the organs of respiration, as speaking, coughing, &c.

The quantity of blood brought up by coughing may be very small, and may not be more than merely sufficient to streak the matter expectorated. In this case it has received a particular designation, viz. that of *haemoptoe*; and it is then often a mere symptomatic effect of bronchial or pneumonic inflammation. In other cases it comes up in distinct mouthfuls; and then consti-

tutes properly *haemoptysis* ; and in some instances large quantities of blood, viz. one, two, or three pounds, are in this manner brought up in the course of twenty-four hours by coughing.

As the disease proceeds, the respiration becomes short and interrupted ; the patient finds he cannot cough or speak without bringing up more or less blood ; and while he is distressed with cough and difficult breathing, or a sense of weight and tightness in the breast, he suffers from flushing of the face, with cold extremities ; the pulse is constantly quick and full ; and the strength declines daily.

Often after the first discharges of blood the patient feels his breathing more free and open ; and if the bleeding returns no more he thinks he is recovering ; and, indeed, no hemorrhage may return for some time. Too frequently, however, the same symptoms return, and, passing through the same course, are followed by the same discharge of blood from the lungs. In this manner the patient may proceed for weeks, months, and even years ;—recovering after each attack of hemoptysis a certain, sometimes a considerable, degree of strength, enjoying immunity more or less from cough, difficult breathing, and pain or weight in the breast, yet always liable at certain periods after an attack of catarrh, after exposure to great heat or cold, or after any great mental emotion or corporeal effort, to the recurrence of the hemorrhage to greater or less amount.

If the chest be examined during the attack, it is not always possible to recognize very distinct symptoms, unless when the blood is actually flowing. At that time there is large fluid gurgling, which obscures respiration, but accompanies its motions, so that at certain points, especially corresponding to the large bronchial tubes, the air sounds as if passing through a fluid. Often there are, immediately before the attack, sonorous *rhonchi* and sibilous wheezing, with obscured or extinct vesicular respiration. In other instances, there is crepitous rattling and slight resonance of the voice. In one case, in which I had no doubt that the lungs were in the state of hemorrhagic congestion, from the fact that the patient was labouring under *purpura hæmorrhagica*, I found the whole central and inferior portion of both lungs to be occupied by the moist crepitous rattle, with large bells, and vesicular respiration altogether extinct. In more advanced stages of the disorder, the voice is strongly resonant at certain points,—a circumstance which may depend

either on consolidation or tubercular infiltration of particular parts of the lung.

Percussion and the sounds elicited by it do not furnish much precise information on the state of the lungs. In some instances the greater part of the chest, at least anteriorly, sounds natural, or clearer than natural; in other cases the sounds are dull. The latter is particularly the case when hæmoptysis takes place in the early stage, or in the course of tubercular deposition in the lungs.

When the hemorrhage ceases, the febrile symptoms with the cough may altogether subside. Too often, however, cough continues, with some mucous expectoration and slight quickness of pulse, augmented at evening, or in the night. In this state of symptoms one of two results may take place, *1st*, either a fresh attack of hemorrhage comes on, and proceeds to some extent; or *2d*, a state of constant fever, with cough and expectoration, ensues, while the flesh wastes and the strength declines, and the patient is at length hectic. A new train of symptoms then demands attention.

PATHOLOGY.—On the pathology of spitting of blood, physicians appear to have entertained either erroneous or indistinct ideas. The ancients ascribed it to rupture of some of the pulmonary vessels; and this opinion was adopted by many practitioners, and is still entertained by the vulgar, to whom this disease has been long known by the name of *rupture of a blood-vessel*. This opinion, however, is manifestly contradicted by anatomy and by observation. In modern times this opinion regarding the pathology of pulmonary hemorrhage is found to be correct in two cases only; first, when an aneurismal tumour or a diseased artery bursts into the air tubes (*bronchia*), or the windpipe; and secondly, when an arterial branch, passing through a tubercular excavation, has given way during the progress of ulceration. Neither of these cases, it is obvious, are necessarily connected with true pulmonary hemorrhage. Both are followed by immediate or very speedy destruction. But the process of hæmoptysis may recur from time to time during months or years in the same individual, or even the whole of a long life; yet without being the direct cause of death.

In modern times, the opinions on the nature of pulmonary hemorrhage may be referred to two heads. According to one

of these views, hæmoptysis was the result of an actual wound or breach in the bronchial or mucous membrane of the lungs. This was the opinion of Barry, Grant, Gilchrist, and even of Cullen, if we understand him aright. According to the other view, which is more recent, hæmoptysis was believed to depend on some disorder of the bronchial membrane, and its exhalant vessels; in consequence of which they discharge blood instead of mucus. This opinion was that of Bichat, who has been followed by all the physicians of the Parisian school, and by many in this country. This opinion is, as I have already shown, well-founded within certain limits only. There are cases of hæmoptysis in which the bronchial membrane and its capillaries only or principally are affected; and then the blood which is occasionally coughed up is the result of exhalation or of destillation, as it used to be named by the older pathologists. Such are the discharges of blood which take place in slight cases of hæmoptysis or pulmonary catarrh about the termination of peripneumony, about the commencement of consumption, and in young females after the suppression or retention of the menstrual discharge.

There are, however, many instances of bleeding from the lungs in a violent and extreme degree, for which it is impossible to account by capillary exhalation only.

Dr William Stark was the first who described accurately the state of the lungs in these instances of hæmoptysis. The air-vessels in some parts of the lungs he found filled with blood or bloody serum; these parts did not collapse on opening the chest, but were firm, very dark or light-red in colour, and could neither be compressed nor distended by the usual inflation. When cut into, thick blood or bloody matter issued from the cut surfaces; and portions of the diseased parts, after being for some time macerated in water, still sank as before maceration. He further showed, by blowing air into the blood-vessels and air-tubes of the sound and diseased portions respectively, that in the latter, air passed from the branches of the pulmonary artery and veins into the bronchial tubes,—in other words, that the minute arteries and veins or capillary vessels of the lungs communicated freely with the bronchial tubes and air-cells.*

This description is extremely accurate, but appears to have been altogether overlooked. Its accuracy has been confirm-

* The Works of the late William Stark, M. D., &c. London, 1788, p. 34.

ed by various subsequent observers, and especially by the researches of Laennec. The facts ascertained in this manner show that a considerable change takes place in hæmoptysis in the pulmonary substance, or the proper tissue of the lungs. A portion of the organ becomes uniformly hard, of a dark-red colour, and impermeable to the air. The indurated spot is always partial, from one to four cubic inches in extent, pretty exactly circumscribed, with healthy or pale-coloured lung, and looks not unlike a clot of venous blood; circumstances by which it is to be distinguished from pneumonic induration, which terminates more or less gradually in sound lung. These changes consist in effusion of blood into the parenchyma of the lungs, and into the bronchial tubes; and as they are analogous to those which take place in the brain in apoplexy, Laennec rather affectedly applies to them the name of pulmonary apoplexy. They are confined chiefly, however, to the severer forms of pulmonary hemorrhage.

Not even is this description, however, sufficient to explain all the phenomena of pulmonary hemorrhage. The changes of the pulmonic tissue here described by Laennec, are rather the effects of a previous morbid state of the capillary circulation of the lungs, than the actual state of the morbid process, which gives rise to effusion of red blood from the bronchial membrane. When the lung is in the state described by this pathologist, the blood has been already discharged from the vessels, or extravasated not only into the cells of the pulmonic tissue, but into the minute extremities of the bronchial tubes, which are thus filled and obstructed within, while they are compressed and obliterated without. But it is the agent that causes this effect, which it is the object of the pathologist to know; it is the state of the capillary circulation which terminates in this effusion, which it is necessary to explain in unfolding the pathology of pulmonary hemorrhage. This it will be found consists in more or less injection and distension of the capillaries or minute arteries and veins which are distributed through the pulmonic tissue, to wind round, and ramify in the minute or extreme bronchial tubes.

Keeping out of view the bronchial arteries and veins which accompany the ramifications of the bronchial tubes, the proper pulmonic tissue is traversed by three orders of vessels, which finally are distributed more or less extensively under the

bronchial or mucous membrane. There are the red capillaries of the lung, the colourless capillaries, and a set of vessels which, as they are believed to contribute to the proper secretion of the mucous membrane, have been named exhalants. The first of these are the minute vessels between the pulmonary arteries and the pulmonary veins. Anatomical examination shows that these vessels are not ramified directly on the attached surface of the bronchial membrane, but are gradually divided into minuter tubes, which are insensibly lost in the submucous pulmonic tissue. The second order of vessels is in all probability formed chiefly in this manner by the subdivision of the first, and communicate in like manner with colourless veins. If we admit the existence of exhalants, and it is difficult to see how this can be denied, it is manifest, principally from the phenomena of artificial injections, that they are derived from the capillary terminations of the pulmonary artery.

Of these circumstances it is indispensable to be aware, in order to understand the immediate cause and the pathological process of pulmonary hemorrhage. Previous to this event, not only do the red capillaries become much fuller and more distended than their natural capacity, and their organic properties are fitted to admit; but the colourless capillaries, and finally the exhalant vessels, are injected with red blood. At the same time, the ordinary passage of blood into the pulmonary veins, red and colourless, is interrupted, and the healthy process of exhalation is suspended. This state of the circulation, which may be, and generally is, confined to a lobule, or small portion of the lung, continues no long time when red blood comes to be effused, first into the pulmonic tissue, and afterwards through the exhalants on the surface of the bronchial membrane; and it is at this period of the process that the affected part begins to present the appearances described by Laennec. It may even happen when the blood, extravasated into the submucous tissue, is considerable, and the vessels of the bronchial membrane are very highly injected, that this membrane may give way and be ruptured slightly in one or two places. These facts, which may be observed in the lungs of persons who have been cut off during hæmoptysis or after its cessation, show that the blood is discharged in the first instance by exhalation, but afterwards both by exhalation and laceration of the pulmonary mucous membrane.

I feel it further requisite to observe, that Laennec has not given a correct representation of hæmoptysis in two circumstances. The first is, that he represents profuse hæmoptysis always to depend on the hemorrhagic engorgement and induration of the lungs; and the latter to be connected with, or give rise to, the former. Now, I have observed and treated during life several persons with very moderate, but constant hæmoptysis, in whose bodies, after death, I found the lungs affected with large and well-marked portions of dark-brown indurated lung; and conversely, I have seen large quantities of blood discharged from the lungs by persons in whom, after death, I found mere infiltration of tubercles and chronic bronchial disorder.

The second point in which I feel it requisite to say that Laennec has not given a correct or full history of the pathology of hæmoptysis, is one about which, perhaps, different individuals may entertain different opinions, according to the results of their respective experience, but which is in my opinion too important to be overlooked. Bichat, and particularly Corvisart, observed that, in certain forms of disease of the heart, especially the active aneurism of the latter, or what is at present termed hypertrophy, expectoration of blood was a symptom of the second and third stages of the disease. The same circumstance was also noticed by Mr Allan Burns, who, however, has hypothetically connected this symptom with dilatation of the right side of the heart. All the best marked cases of pulmonary hemorrhage with hemorrhagic induration which I have seen, have been connected with ossification of the mitral valve, and arctation of its aperture, or hypertrophy of the left ventricle. The operation of the former it is easy to understand. The blood does not pass with its wonted facility through the mitral valve into the left ventricle; the left auricle is consequently kept in a constant state of over-distension; this distension is propagated along the pulmonary veins to the pulmonary capillaries, which are thus perfectly filled and distended with blood, which is not allowed to be moved into their trunks in the usual manner, and with the wonted regularity. As this distension is every hour and day increasing, with the persistence and increase of the obstruction in the left auriculo-ventricular aperture, it is not wonderful that the blood is extravasated into the pulmonic filamentous tissue, and through the bronchial membrane, causing in the former the dark-brown-coloured circumscribed masses which are found

after death, and in the former the bloody expectoration which takes place during life.

It is remarkable, nevertheless, that this extravasation and its effects are greatest and most conspicuous in young persons. A degree of degeneration of the mitral valve and arctation of its aperture, which produces little inconvenience at or beyond the age of sixty years, causes between the ages of twenty and thirty extreme *dyspnæa* and *orthopnæa*, cough, hæmoptysis, and all the accompanying symptoms, with serous infiltration into the different cavities and the subcutaneous cellular tissue.

Much the same phenomena may take place in consequence of dilatation or hypertrophy, general or partial, of the left ventricle. Often, indeed, the dilatation or excentric hypertrophy and the concentric hypertrophy are the result of disease of the semilunar valves at the origin of the aorta; but, in several instances, they take place independently of this. When they do ensue, they give rise to a similar state of imperfect transmission of the blood out of the ventricle into the aorta; and the left ventricle, auricle, and pulmonary veins become unduly distended, and eventually the pulmonary capillaries are constantly distended with an unusual load of blood, which at length is extravasated, and causes the same state of the lung, and the same expectoration of blood, which takes place at an earlier period in the degeneration of the mitral valve.

These facts may be regarded as established. But another important question still remains for determination. What is the cause of this distension or injection of vessels, when it cannot be traced to disease of the heart? What is the nature of that condition of the pulmonary capillaries which allows them to be so unusually distended? What change do they undergo in properties in living persons in that particular portion of lung, in consequence of which they become distended with blood, which stagnates in them, and at length is forced from them by extravasation? And lastly, why does this state not give rise to inflammation and its consequences? To these questions no satisfactory answer has hitherto been given. In the language of the Hallerian school, it would be said that the irritability of the affected capillaries was gone; in that of Cullen, it would be said that they were affected with spasm; and in the language of Bichat that they had lost their organic sensibility and contractility. According to others, loss of tone would be considered as the source

of the disorder. But as each of these opinions supposes properties, the existence of which is not demonstrated, it would be unreasonable to attach to them much importance. It may be indeed said, that many phenomena prove the capillary vessels to possess certain powers, by virtue of which the blood moves through them, and they are never permanently distended beyond a certain calibre; then these powers must be inferred to be lost previous to distension and extravasation; and that this *adynamic* or enfeebled state of the capillaries is, as in inflammation, the cause of hemorrhagic injection. Whether this idea be well-founded or not, there is here little space to inquire; and it is submitted as a probable conjecture, to be confirmed, modified, or refuted by further observation.

I have still to observe, that profuse hemorrhage from the lungs I have seen take place in consequence of tubercular deposition and infiltration. In various persons the deposition of tubercular matter, either in the lungs or at the extremity of the bronchial tubes and vessels, induces the same disorder in the motion of the blood through the pulmonary capillaries which takes place in diseases of the heart. As the presence of these bodies encroaches both upon the lungs and the blood-vessels, the different vessels of the lung become distended with blood, which is not allowed to move through them with the natural facility and rapidity; accumulation consequently ensues; and afterwards extravasation, and sometimes even vessels have been found ruptured.

When the tubercular deposition is extensive, and beginning to cause vascular congestion, serous extravasation, and softening, it also happens not unfrequently that the vessels become much enlarged and distended; their tunics at the same time are involved in the morbid changes, become thickened and covered with morbid products, and are thereby rendered brittle and lacerable; and in this condition they often give way and cause profuse hemorrhage.

Lastly, it has been observed, in inspecting the lungs of persons who have died of breaking down tubercular masses, and after these masses have been often excavated, that, though in general some provision is made against the ulcerative destruction of the blood-vessels by coagula being formed in them, and by their cavities being obliterated, yet in some instances a vessel has been found passing near or across a tubercular cavity, and, hav-

ing been opened, has poured forth much blood, which has been partly brought up by coughing, and partly filled the cavity with bloody clots, as was ascertained by inspection after death.

ETIOLOGY.—The causes of hæmoptysis may be understood from the account already given of the different circumstances under which hemorrhage may take place. They may be shortly enumerated in the following manner: *First*, inflammatory action and induration; *secondly*, hemorrhagic induration, with or without disease of the heart; *thirdly*, disease of the arteries; *fourthly*, tubercular déposition; *fifthly*, tubercular destruction and excavation; and *sixth*, bronchial hemorrhage.

As to remote causes, it is found that exposure to cold, ascending acclivities, or climbing mountains, blows or injuries of the chest, or over-exertion of the lungs, in running, walking fast, speaking, and similar actions, have been known to induce pulmonary hemorrhage. The frequency with which attacks take place during the night seems referable to the increased heat of the body at that time.

I know not to what circumstances to refer the alleged operation of a cause to which great importance has been attached by Dr Moseley, in explaining the periodical recurrence of hemorrhagies from the lungs. According to this author, the greater hemorrhagies from the lungs, or those of plethora, as they used to be named, obey the influence of the moon; and he adduces, in proof of the justice of this inference, various cases in which blood was discharged from the lungs at every period of new or full moon. In general, according to his statement, the hemorrhage appears to have come on the day after new moon or full moon. According to Dr Moseley, the influence of the moon on the atmosphere is sufficient to act upon the circulation of delicate individuals, and especially those with plethoric and tender lungs, so to induce hemorrhagic congestion, and a discharge of blood from the lungs.* This doctrine I give as I find it. Without presuming to question the fact, I may observe, that it is first requisite to be assured that it is so in a sufficient number of instances, before it is proper to give any explanation.

In some instances attacks of hæmoptysis have been traced to the irritation occasioned by worms in the alimentary canal.

* A Treatise on Tropical Diseases; and on the Climate of the West Indies. By Benjamin Moseley, M.D. 4th Edition, with Additions. London, 1803, p. 561 and 569.

(Andry, *Traité des Vers*; Rumsey, *Medico-Chirurgical Transactions*, Vol. ix. p. 389.)

PROGNOSIS.—The terminations of hæmoptysis vary according to the state of the lungs of the individual. In the case of simple hemorrhage from the bronchial membrane, there is no doubt that the disease may terminate in resolution. The discharge of blood itself tends to cure the disease which caused it; and in some instances spontaneous recovery takes place in this manner. This, however, will be greatly facilitated, if the patient be kept cool and observe absolute rest, and if measures likely to diminish the vascular plethora of the lungs be adopted. In this manner many persons recover from attacks of pulmonary hemorrhage, and live for years. In one case of pulmonary hemorrhage, often very profuse, the patient recovered from repeated attacks, presented no proof of lesion of the lungs, and, after remaining for nine years free from hemorrhage, died at last of another disorder.

Even in the severer forms of the disease in which bloody congestion and extravasation have taken place, Laennec believes that resolution may take place with considerable facility. This conclusion he deduces from the number of cases of recovery after severe hæmoptysis, and from the circumstance of his being unable to trace induration in subjects, who had been affected with a violent form of the disease some years antecedent to their death. In this, however, there is some fallacy. For a great and copious discharge of blood from the lungs may take place in persons whose bronchial membrane merely is affected, without pulmonic induration; while this last condition may exist and give rise to very trifling and inconsiderable hemorrhage.

The worst thing to be apprehended in hæmoptysis is its leaving in subjects disposed to pneumonic disease, a chronic insidious inflammation of the pulmonic tissue. This process commences unfortunately in an imperceptible manner. The pulse may not be quicker, at least in the horizontal position, than natural; there may be little or no cough; and the patient may feel so little inconvenience in his chest, as to be able to take a deep and full inspiration without any feeling of pain. The only symptoms which seem to attend this disorder are a hot, dry, imperspirable state of the skin, particularly the palms of the hands; quickness of the pulse by about 10 or 12 beats dur-

ing the night, and towards morning, (from 12 to 3), and heat and flushing of the cheeks about the same time. When these symptoms have continued for two or three weeks, either fresh hæmoptysis comes on, or all the phenomena of chronic peripneumony are fully established.

Lastly, if spitting of blood take place in a person already labouring under symptoms either of chronic peripneumony or of tubercular disorganization, the prognosis is very unfavourable; for it is too often symptomatic of the progressive advancement of these diseases to a state of great congestion, or, in the case of the latter, to ulceration and excavation, and thereby to the fatal termination.

It has been often said and taught, that hæmoptysis may terminate in pulmonary consumption; and this view of the relation of the two disorders is favoured, not only by the account of the two disorders given by Dr Cullen, but by the usual circumstances and subjects in whom these diseases take place. They are, nevertheless, not always necessarily connected; nor does hæmoptysis necessarily give rise to consumption. But it must be observed, that hæmoptysis is so often an effect of tubercular deposition in the lungs, or of tubercular ulceration and excavation, that it appears as the first manifest symptom, and, therefore, is erroneously regarded as the cause of all the subsequent train. It will in all cases of this description be found, nevertheless, that, previous to the occurrence of the hemorrhage from the lungs, there were symptoms of tubercular deposition, and, not unfrequently, of softening and excavation. The hemorrhage, therefore, is not the cause but the effect of the disorganization of the lungs.

TREATMENT.—THERAPEUTIC INDICATIONS.—Agreeably to the pathological principles already established, it becomes requisite in all cases to consider attentively the cause of the hemorrhage, before any definite method of treatment be adopted. As the discharge of blood is an effect of a particular state of the lungs, it is requisite rather to apply remedies to the state of the lungs than to mere symptoms. This must show at once the absurdity of the indiscriminate use of those agents to which the name of astringents and styptics has been upon a false analogy applied. Whenever pulmonary hemorrhage depends either on vascular plethora, inflammation, or congestion, it is requisite to oppose it by means of antiphlogistic measures.

It may sometimes be difficult to say whether it proceed from this cause, or from breaking down of a tubercular mass; but even in the latter case, it is safest to err on the side of the antiphlogistic treatment, than to neglect the hemorrhage until the tissue of the lungs is much or wholly destroyed. If attention were paid to this rule, there would be less discordance and contradiction among physicians as to the employment of blood-letting, or the adoption of other means for the cure of pulmonary hemorrhage.

The first, therefore, and the wisest and safest plan, is to regard the hemorrhage as the result of inflammatory or hemorrhagic congestion, and to adopt with promptitude and activity the different parts of the antiphlogistic regimen.

Of these the first and most important, because the most powerful, is general blood-letting, which should be carried to as great extent as the strength of the patient will permit; and if it be carried to faintness, or at least to approaching faintness, it will be so much the more effectual in restraining the hemorrhage from the lungs. The extent to which it is requisite to carry blood-letting in this disease is sometimes very great,—as much as in pneumonia; and 30 or 35 ounces may be taken from an adult at once, before much impression is made on the system in the way of checking the hemorrhage. In some cases it is requisite to take at first a smaller quantity, for instance 20 or 25 ounces; in consequence of the patient not being able to endure the loss of a larger quantity of blood. But it is then necessary to take nearly as much at a second, and sometimes 16 or 18 ounces more at a third blood-letting, before the hemorrhage evinces a tendency to diminish or cease.

In depleting in this manner it is proper to be guided, not by the diminution or cessation of the hemorrhage alone, but by the marks of returning ease in respiration, by the diminution or cessation of feelings of pain, weight, constriction or oppression in the chest, by diminished frequency, urgency, and hardness in the cough, and by the diminished frequency and hardness in the beat of the pulse.

In those cases in which the hemorrhage continues after due general depletion, it is advantageous to detract blood from the interscapular region by means of cupping; or to apply leeches to the anterior part of the windpipe, immediately above the sternum. But all these measures are greatly less efficient, and

exercise much less influence upon the disease, than blood-letting from the system.

In those cases of pulmonary hemorrhage in which the disease recurs at stated, or at least frequently recurring periods, with febrile symptoms and more or less wasting, blood-letting is a most valuable and effective remedy; and it should be repeated as often as the hemorrhage recurs, or even as a preventive, as often as the patient feels those sensations and symptoms which make him believe that an attack is impending. Dr Cheyne of Dublin showed, in 1830, the efficacy of this method of treatment, especially in that class of hæmoptysical cases in which the symptoms threaten to pass into pulmonary consumption. He gives, in illustration of the therapeutic influence of this remedy, repeated every week or two weeks to the extent of six, seven, or eight ounces,—a case in which, after all other means had been tried without good effect, complete recovery took place.*

Next to the employment of blood-letting, it is of importance to keep the patient in a moderately cool apartment, in a state of perfect quiescence both of body and mind, and to enjoin the most absolute repose of the organs of respiration and speech. He must be kept in the horizontal position, with every muscle, and especially those of the chest and pectoral extremities, in a state of as complete inaction and relaxation as may be practicable.

The blood expectorated, or the articles soiled with it, should, after being seen by the physician, be removed from the apartment; and the patient should be recommended to observe a silence as perfect and uninterrupted as possible.

As soon after the first blood-letting as possible cathartic medicine ought to be administered, so as to act gently and steadily, but effectually, on the bowels, and evacuate their feculent contents. The most convenient is two or three of the compound colocynth pills, or one drachm or one drachm and a-half of the compound jalapp powder, succeeded in the course of from six to ten hours by one ounce of castor oil. It is of great consequence in the course of the treatment to keep the bowels in a regular or rather loose condition; and this must be done partly by the periodical admi-

* Small and frequently repeated bleedings in Hæmoptysis and Incipient Phthisis, recommended, in a Letter to R. G. Graves, M. D., &c. from John Cheyne, Esq. Physician-General. Dublin Hospital Reports, Vol. v. p. 351. Dublin, 1830.

nistration of laxatives, or by that of enemata, or by diet. In some cases previous to the attack the secretions of the stomach and intestines are unhealthy; and it is requisite to improve them by the use of efficient laxatives, and by the alkaline carbonates. In those cases in which worms are suspected or known to be present in the intestinal tube, repeated doses of calomel, either alone or with jalap, followed by oil of turpentine, olive oil, castor oil, or the powder of the male fern, may be advantageous. In other cases, the tin powder, or any of the other anthelmintics, should be administered. Mr Rumsey employed the oil of turpentine with great advantage. Is it in this form of hæmoptysis that muriate of soda, or common salt, to be afterwards noticed, has been found so efficacious?

As adjuvants to blood-letting and laxatives it is advantageous to employ the sedative influence of the nauseating emetics and anodynes. Full vomiting was beneficially employed by Dr Bryan Robinson of Dublin; and the practice was advantageously imitated by Dr Cullen; but the increase of the hemorrhage to an alarming extent prevented him from continuing the practice. It is perhaps not safe, and is, at best, but an equivocal remedy. But if either ipecacuanha or tartrate of antimony be given, so as to produce their nauseating and depressing effects, often under their employment the hemorrhage ceases, the cough is abated, and the pulse falls. With the intention now specified, ipecacuanha may be exhibited in pulmonary hemorrhage, in doses of one grain or half a grain, or two grains every second or third hour, according to the effects produced. Tartrate of antimony operates in the same manner, and may be exhibited with the same object. The most eligible plan is to dissolve four or eight grains of tartrate in one or two ounces of water, and exhibit about one tea-spoonful, or a single drachm, every hour or second hour, according to its effects.

After the most urgent symptoms have subsided, it is sometimes desirable to combine with either of these remedies a small proportion of opium, or the solution of muriate of morphia, the anodyne effect of which seems to be very efficacious in restraining hemorrhage, and abating that morbid irritability of the system by which the hemorrhage is often kept up. For this purpose two drachms of the solution of muriate of morphia may be added to the two ounce solution of tartarized antimony above-

mentioned, after which the solution may be given in the same manner.

The effects of tobacco and foxglove are very similar. The latter was much employed by Dr Ferriar, who gave it in the treatment of pulmonary hemorrhage, in the form of pill, in doses of half a grain or one grain of the powder, sometimes alone, sometimes with an equal quantity of opium, every four, five, or six hours, according to the urgency of the symptoms. At the same time it is requisite to watch carefully its effects upon the pulse and the brain, and never to allow it to produce too great depression. In other cases, it is given in the form of tincture, in doses of ten minims, five or six times daily. In this mode I have given to the extent of 80 minims daily in pulmonary hemorrhage, with the effect of inducing nausea, vomiting, and double vision, and at the same time suspending the flow of blood. It may also be given in the form of infusion, though this is less properly applicable to the treatment of hemorrhage than of dropsy.

Revellents or derivative agents are also beneficial as adjuvants to blood-letting. Thus, sinapisms or blisters applied over various parts of the chest are sometimes useful in withdrawing the blood from the lungs towards the surface. In order to be effectual, however, they ought to be applied with as little loss of time as possible. When the disease has assumed a chronic form, it is often advantageous to establish an issue between the shoulders, by means of the caustic potass, or to insert a seton in some part of the trunk, or at the nape of the neck.

The effect of general blood-letting will be greatly aided by cupping between the shoulders, and the application of blisters to the chest.

It has been further supposed that much benefit has resulted from the use of remedies of astringent or refrigerant properties. Of these the principal are sulphuric acid, either diluted, or in the form of ethereal elixir, white vitriol (*sulphas zinci*), blue vitriol (*sulphas cupri*), alum (*sulphas aluminæ*), nitre (*nitras potassæ*), common salt (*chloridium sodii*), and sugar of lead (*acetas plumbi*).

Sulphuric acid or oil of vitriol has long been used in repressing or moderating hemorrhage from the lungs; and it may be said to be the appropriate popular remedy. Its dose is from 25 to 40 drops of the aromatic tincture or elixir, three, four, or five times daily in a glass of water; and to prevent it from

acting on the teeth, it should be sucked through a glass tube or a quill. It is not easy to say whether it has any actual influence on the disease, or whether the quantity of cold water thus drunk is not the true remedy. It is certain that it is abundantly safe; and many cases of hæmoptysis get well under its use.

The same acid, combined with zinc, copper, or alum, may be usefully administered in moderating and checking this hemorrhage. White or blue vitriol may be given in the dose of a grain or two three or four times daily; alum to the extent of fifteen or twenty grains every hour, until the discharge of blood abates. A combination of white vitriol and alum with cochineal, is strongly recommended, under the name of the vitriolic solution, by Moseley. In hemorrhagies from the lungs, he informs us, whether attended with great arterial discharge, or mere spitting of blood, he has known it, taken in nauseating doses every eight or ten hours, remove the disease. Previous evacuation, however, must not be neglected.*

Among medicines to which refrigerant properties have been ascribed, nitre (*nitras potassæ*) holds a conspicuous place. This substance has been long used both in febrile and inflammatory disorders, and has been believed to be particularly indicated in affections of the lungs, especially hemorrhage. It may be given in doses of from three to five grains, four or five times daily, either alone or with any of the other astringent or refrigerant powders already mentioned. I have seen it given along with alum with great apparent benefit.

Common salt, (*Muriate of Soda, Chloride of Sodium, Chloruret of Sodium,*) was first recommended as a remedy in hæmoptysis by Rush, who ascribes to it great efficacy, but admits that its use does not supersede blood-letting when indicated by the state of the pulse. From a tea to a table-spoonful of clean fine salt was given as soon as possible after the hemorrhage from the lungs, which is said then in general to stop. But the dose must be repeated daily for three or four days to prevent a return. If this should happen, or if the bleeding does not cease, the practice was to continue it in larger doses. Two table-spoonfuls have been taken at once for several days in this manner. †

* A Treatise on Tropical Diseases, p. 358 and 541. London, 1777.

† Medical Inquiries and Observations, Vol. i. p. 191.

In other countries, especially in Italy, it has been a practice not uncommon to administer for the treatment of pulmonary hemorrhage various vegetable astringents. Of this kind are the Malta agaric (*Fungus Melitensis*,) recommended as a powerful remedy in the Bologna Commentaries, (T. i. p. 158,) and the vulnerary water of Julian Landi, a Roman apothecary. The latter, indeed, was partly a vegetable infusion or decoction, partly a saline solution. The whole of these remedies, however, are either inert or hurtful.

Vinegar, which appears to possess astringent and sedative powers, has been proposed as a remedy in this disease; but we know little of its actual effects. It is probably best taken as an agreeable drink, when properly diluted with water.

When the disorder has become in some sense chronic and habitual, recurring often, either in the form of bloody expectoration, or distinct discharges of blood, after all other remedies have been carried to as great an extent as the strength of the patient may seem to allow, it is sometimes of great benefit to have recourse to exercises of gestation. Equestrian exercise is supposed by some physicians to be ambiguous in effect, and rather perilous. Carriage exercise along a smooth road, on the other hand, is believed to be safer and more beneficial; and in general it requires to be continued for several days before much amelioration can be recognized.

But by far the best and most sanative species of gestation is that obtained by sailing; and hence, during a sea voyage of some length, attacks of pulmonary hemorrhage have been often observed to cease entirely, and the patient has recovered a considerable degree of health and strength. In effecting this change it is possible that the constant sea-sickness may exercise a powerful and sanative influence; but there appears to be something also in the mode in which the blood is distributed equally to the skin, and hence prevented from accumulating in the vessels of the internal organs.

Regarding the choice of the voyage, that is of little moment, if it be sufficiently long. Though sometimes during a voyage of a single week, an attack of hæmoptysis may disappear, yet in general it is more likely to disappear more thoroughly during a voyage which lasts from three to six weeks. Even in cases in which it may be deemed improper to venture on a long voyage, frequent sailing is highly benefi-

cial; and at present a hemoptisical patient might sail round the whole of the southern part of the island with the effect of allaying the morbid irritability of the vascular system of the lungs. In other instances, a voyage up the Mediterranean might be beneficial; but it is seldom desirable for pulmonary invalids to be in that part of the world during the summer season. Such a course is very likely to precipitate the hemorrhagic state of the lungs into tubercular destruction, with rapidly proceeding consumptive symptoms. A safer method is assuredly during the summer months for hemorrhagic invalids to confine themselves to the navigation of the British seas, and occasionally to reside either in the south-west coast of England, or the west coast of Scotland.

With all the measures now specified, suitable diet and regimen ought to be conjoined. At the commencement of the attack, while the pulse is quick and the hemorrhage copious, and often recurring, the patient should adhere to the lowest possible diet adequate to maintain life. All his food ought to be thin and consisting of vegetable matter, as arrow-root, sago, tapioca, ground rice, panado, and similar articles. Much fluid is supposed to be detrimental, by increasing the quantity of blood in the vessels. All the food and drink should be taken cool, if not cold, never hot; and even an attack of hemorrhage when apprehended may sometimes be stopped by a glass of cold water. The most convenient food, in short, is grapes in small quantity; and upon this I have seen a hemorrhagic patient live for days. After the acute stage is over, the patient should still adhere to vegetable food if possible.

§. III. Vomiting of Blood. *Melæna*, Hippoc. *Vomitus cruentus*, Stahl and Hoffmann. *Hæmatemesis*, Sauvages and Cullen. *Gastrorrhagia*; *Enterorrhagia*. La Maladie Noire.

S. A. D. Tissot, *Dissertatio de Morbo Nigro, Scirrhis viscerum, Cephalaca, &c. cum Cadaverum sectionibus*, Lausannæ, 1760, apud Sandifort Thesaurum, Tom. i. —Clinical Experiments, Histories, and Dissections. By Francis Home, M. D. Third Edit. London, 1783. Section vii. *Melæna*, p. 127.—Zacchiroli, *Osservazioni della Melæna*. Imola, 1793.—Hœhn, *Diss. Cogitata quædam de Morbo nigro Hippocratis, vomitu cruento et diarrhœa cruenta*. Jena, 1796. —A Practical Treatise on the Diseases of the Stomach and of Digestion, &c. &c. By Arthur Daniel Stone, M. D., &c. London, 1806. Chap. viii. p. 99, Hemorrhagy from the Stomach.—Observations sur la Maladie Noire, &c. Par A. Portal, Prof. de M. &c. *Memoires de la Societ  Medecale d'Emulation*, Tome ii. p. 107.—*Memoires sur la Nature et le Traitement des Plusieurs Maladies*, iv. Tome, 8vo. Par Antoine Portal, Prof. de M. &c. Paris, 1800-1819.

Tome ii. N. 9, p. 129.—A Case of Melæna, &c. &c. By John Cheyne, M. D. Dublin Hospital Reports, Vol. i. p. 259. Dublin, 1817.—Observations on the Utility and Administration of Purgative Medicines, &c. By James Hamilton, M.D. Edinburgh, 1827. Chapter viii.

DISCHARGE of blood from the stomach by vomiting was regarded by Cullen as symptomatic either of local disease of the stomach, or of the black disease of Hippocrates, (*Melæna* ; *Morbus niger*), or of external violence ; and, therefore, though its name was admitted into the nosology, it received no place or consideration in his system. There is no doubt that mere vomiting of blood, or discharge of this fluid by stool, is much oftener a symptom of some other disorder, than a primary affection itself. Thus it may be a consequence of diseased liver, of diseased spleen, or diseased pancreas ; it may be the result of ulceration or erosion of the gastric tissues ; it may be the result of aneurism or other disease of the arteries ; it may occur in the course of scurvy ; it has been known to arise from the presence of a leech within the organ ; and it is well known to be a very bad, generally a fatal symptom in those fevers of remittent type, which prevail in hot seasons and in tropical countries ; and there is no doubt that it forms the black vomit (*Vomito Prieto*), of the yellow fever.

Though I am thus far disposed to admit the symptomatic nature of gastric hemorrhagy, yet there are cases of this affection, which, whether they depend on disorder of the gastric tissues and circulation, or on that of other organs, must be referred to this head for want of a better. The *Ephemerides Naturæ Curiosorum*, the *Sepulchretum* of Bonetus, the writings of Felix Plater, of Stahl, of Hoffmann, and more recently of Lieutaud, of Morgagni, of Tissot, of Francis Home, and of Portal, contain examples of this discharge, which can be referred to no other source but the mucous membrane of the stomach and small intestines. But, independent of the weight of these facts, I do not know that the distinction is, in all circumstances, of very great importance. In one sense every discharge of blood from any of the tissues or organs of the human body may be said to be symptomatic ; and it has been already shown, that both *epistaxis* and *hæmoptysis* are to be regarded as mere symptoms of morbid states of the circulation of the head or the digestive organs, and of the lungs respectively. These views, however they may accord with strict principles of pathological anatomy, become inconvenient in a work of a practical nature ; and I, therefore,

consider it expedient to notice in this place such forms of Hæmatemesis as the physician is likely to have occasion to treat.

It is chiefly in the writings of Hoffmann, Home, Portal, and, lastly, Hamilton, that we find useful information on the nature of the bloody discharge from the alimentary canal. From the researches of these authors I conclude that this disease may arise after violent affections of the mind, after suppression of the hemorrhoidal discharge in men, the menstrual secretion in females, or from general hemorrhagic disposition. Whatever be the real influence of these causes, it is certain that the disease is invariably attended with obstinate costiveness, and a habitual slow state of the intestinal discharge. It is, therefore, not unlikely that its true material cause consists in derangement of the intestinal circulation; and that any circumstance which disorders the regular distribution of blood through the different branches of the mesenteric arteries and veins, and through the system of the portal vein, may very readily give rise to the blood-vomit.

As a general illustration of the ordinary phenomena of this disease, I shall confine myself to the description of that variety which occurs in females, in whom there is great derangement of the intestinal functions, and obstinate costiveness, with or without suppression of the menstrual discharge.

The attack of the hemorrhagy, in these circumstances, is preceded by great languor and oppression about the chest and epigastric region, in which there is also a sense of fulness and weight; by cough, difficult breathing, and sometimes pain of the breast; and by loss of appetite, headach, giddiness, and disturbed sleep. The eye is dull, the face pale and sallow or dingy, and the countenance expressive of distress; the pulse is feeble and quicker than natural, the tongue furred, and the bowels are constipated.

In this state of impaired health, a particular fit of squeamishness and sickness is the immediate forerunner of the attack of the vomiting of blood. The blood vomited is sometimes florid, and at other times black and grumous. The quantity brought up at once varies from a few ounces to a pound or more. The distressing symptoms are relieved by the discharge; but are again aggravated previous to the return of a similar attack. The disease, if left to itself or improperly treated, is of uncertain duration and of unequal severity.

This hemorrhagy may attack females at almost any period of life between 15 and 55 or 60, but it is most common between

the ages of 18 and 30. It has been said to occur only in those in whom the menstrual discharge has either not been properly established after puberty, or in whom it has been suppressed after being once established. Dr. Hamilton, however, has seen it in full severity in females in whom this discharge had never suffered interruption, (p. 102).

Physicians have generally regarded this discharge as vicarious of the menstrual secretion. The facts, however, now mentioned show that this idea is not well-founded; that it depends on the derangement of circulation arising from habitual costiveness; and that, when the menstrual discharge is at the same time obstructed, the same cause is adequate to produce both effects.

Hamilton informs us that he had never, in this disease, been able to ascertain the presence of blood in the feces;—a circumstance from which it may be inferred that the constipated state of the bowels, and especially of the lower end of the ileum, and of the whole colon, causes the blood to be secreted so high up in the canal as to determine its discharge by vomiting only. This, therefore, may be considered a mild degree of the disorder.

A more severe and perfect form is that in which blood or bloody fluid is discharged not only by vomiting from the stomach, but from the bowels by stool. In addition to the symptoms already enumerated, of pain, weight, and fulness in the epigastric region, the patient complains of tension and weight of the belly, pains referred to the bowels, griping more or less severe, sense of wind moving in the bowels, after long and, it may be, obstinate constipation. These complaints are soon followed by sickness and great faintness, vomiting of dark-coloured fluid, with clots of blood, and at length discharges from the bowels, more or less copious, of very dark-coloured matters, in which the appearance and smell of the excrement are very rarely recognized. The call for evacuations of this description returns after various intervals; and each stool is generally followed by a sensation of faintness and great weakness, with more or less griping and tenesmus in some instances. The duration of the disease varies according to the strength and constitution of the patient, and the treatment employed. In some instances, it may terminate fatally in two or three days at the most; in others it may go on for ten days or two weeks

before it shows any appearance either of subsiding, or of inducing such weakness as to threaten the life of the patient.

The matters discharged are always deep-black, but vary in consistence and in smell. By some they are described as similar to tar, viscid, and fetid; by others, as very fetid, shining, and of the consistence of honey; and, in some instances, they have been more fluid, and approaching to the appearance of coffee-grounds. When natural excrement appears it is generally in the form of hardened balls, (*scybala*.) Besides the symptomatic complaints already mentioned, there are generally some thirst, much loss of appetite, foulness of the tongue, and great general languor. The pulse is rarely under 80 beats in a minute, generally about 90, and, in some instances, above 100; but in this symptom there is much variety.

The pathology of this disorder was misunderstood by the ancients, who, it is known, ascribed the symptoms to inundation of black bile issuing from the spleen. A more correct view was first given by Hoffmann, who taught that the bloody discharge, whether from the upper or the lower end of the alimentary canal, proceeds not immediately from the vessels of the stomach, nor from blood extravasated into its cavity, but also from the small intestines, especially the ileum, and from the extremities of the mesenteric vessels, which are there covered by a very thin membrane;—and which he states he had often in dead bodies found still very much distended with black blood, and the whole stomach filled with the same bloody matter.* Francis Home, in like manner, was of opinion, that in two of the three cases which he has recorded, the disease was situated in the ileum, and in the third, “probably in the stomach or beginning of the small guts.”—(Clinical Experiments, &c. p. 138.)

An extensive collection of cases has enabled Portal to present conclusions still more full and satisfactory on the nature of the Black Disease. This learned anatomist has shown;—*1st*, That the black matters discharged by vomit and by stool, or by vomiting only, are not bilious, but genuine blood; since in the patients who have discharged them, and whose bodies have been examined, this matter has been seen to transude from the blood-vessels, even in the stomach and in the small intestines; *2d*, That this transudation takes place from the gastric,

* *Medicinæ Rationalis Systematicæ*, Part II., Sect. i. chap. iii. §. xvii. p. 214.

duodenal, and mesenteric arterial extremities into the cavity of the stomach and intestines, separately or at once, more frequently into the stomach only, in consequence of certain arterial branches receiving more blood than the corresponding veins return; and 3dly, Though compression of the branches of the portal vein may cause this extravasation, the blood is not effused from the *vasa brevia*, where it flows in an opposite direction.*

To the same effect is the testimony of Mr Abernethy on the morbid anatomy of this disorder. "I examined the bodies of several persons who died under attacks of this disease, and found the villous coat of the alimentary canal highly inflamed, swoln, and pulpy. Bloody specks were observed in various parts; and sphacelation had actually taken place in one instance. The liver was healthy in some cases, and diseased in others. I conclude, therefore, that these diseases, which were termed *hæmatemesis* and *melaena*, arose from a violent disorder, and consequent diseased secretion of the internal coat of the bowels; and that the blood discharged when the affection was at its height, did not flow from any single vessel, but from the various points of the diseased surface."†

I have observed several cases of intestinal hemorrhage, both favourable and fatal, to their termination; and in general have found, on examining the latter, reason to concur in the correctness of the views now given. I am disposed to think there are two forms of the disorder; one in which the liver or spleen, generally the former, is indurated and changed in structure; the other, in which the disorder of the capillary vessels is confined to the intestines. In the last case of this kind, of which I have elsewhere given a detailed account, no aperture could be detected, and all that was recognized was great distension of the intestinal vessels with blood, and general oozing from the ileal mucous membrane.‡

It is not to be doubted, therefore, that the blood is discharged in this disease from the capillary vessels of the gastric, duodenal, and ileal mucous membrane; and as it is anatomically

* *Memoires sur la Nature et le Traitement de Plusieurs Maladies*, par Antoine Portal, Tome ii. Paris, 1800, p. 208.

† On the Constitutional origin and Treatment of Local Diseases in the Surgical Works of John Abernethy, p. 30. London, 1811.

‡ Clinical Report on the cases treated, &c. in 1832, 1833, by D. Craigie, M.D. Edin. Med. and Surg. Journal, Vol. xli.

impossible to distinguish these vessels into arteries and veins ; the dispute whether the blood issues from the one or the other order of vessels is frivolous. The blood may acquire its dark colour from two causes, *1st*, admixture with the gastric juice, or hydrochloric acid in the stomach and duodenum ; and *2d*, from the action of the carbonic acid, sulphuretted hydrogen, and other substances of acid properties contained in the intestinal canal.

THERAPEUTICS.—The treatment of this disease may now be said to be well understood. Dr Hamilton has shown that in the milder form, which affects females, the proper remedy is full and effectual purging, so as to restore the healthy state of the gastro-intestinal mucous membrane. For this purpose any of the ordinary purgative medicines may be administered. Dr Hamilton at first was in the habit of giving calomel, either alone or with jalap ; but he regards it as indifferent what purgative be given, providing it produces the proper effect. Aloetic pills, compound colocynth pills, Epsom salts, infusion of senna, with any of the neutral salts, are all perfectly well suited for the purpose. When the load of excrement has been once expelled, much attention must be given to prevent the bowels from again becoming constipated ; and some light laxative should be taken daily to insure the regular evacuation of the bowels. For this purpose the compound rhubarb pill, or five or six grains of rhubarb, should be taken twice daily,—at bedtime, and in the morning ; or a pill, consisting of five grains of rhubarb and one of ipecacuan, will exercise a most beneficial effect on the gastro-intestinal circulation and secretions.

Astringent medicines, as elixir of vitriol, and even bark, were given by Home ; but they are injurious, or at least useless, in the early stage, previous to full and effectual purging ; and after that has been done, it is of little moment what is given, as the disease has in all likelihood subsided.

In that form of the disease in which blood is discharged from the bowels, either pure or blackened, the same treatment is to be adopted. Hamilton informs us that he has found aloes to be the most useful purgative, (106.) Two or three of the common aloetic pills may be given every hour or second hour, until the bowels discharge matters of the characteristic feculent aspect and odour ; and when this takes place, in general the discharge of dark-coloured, tar-like, oleaginous, or treacle-like

stools ceases. In other instances, the compound colocynth pill produces, in similar doses, the same effects. A very convenient and efficient laxative, in this state of the intestinal tube, consists of one part of sulphur and two of the compound jalap powder, that is to say, half a drachm of the former, with one drachm of the latter. In those cases in which it may be apprehended that either aloetic, or colocynth, or jalap cathartics may be too irritating, it may be expedient first to evacuate the bowels by means of purgative enemata, and after this to have recourse to the aloetic or colocynth pills. In general, however, the dread of inducing irritation, and thereby aggravating the hemorrhage, is totally unfounded; and, indeed, the more promptly the bowels are relieved of their morbid and unnatural contents, the more speedily does the black or bloody discharge cease. I have employed even oil of turpentine not only without injury, but with manifest advantage.

There is, nevertheless, a class of cases of the black disease in which it becomes necessary to modify this practice considerably. If, for example, there be much distension, fulness, or pain of the belly or any of its regions, if any degree of swelling or pain be recognized in the right hypochondre in the region of the liver, or if any fulness or tension be recognized in the left hypochondre in the region of the spleen, then it becomes requisite not to trust to the effects of cathartics alone, but to have recourse to measures calculated to reduce the swelling and remove or diminish the distension. In such cases, it must be borne in mind that the hemorrhage is in some respects a salutary discharge, which is evidently caused by the enlargement, tumefaction, and vascular engorgement of the viscera, and that, while no direct means can with propriety be employed to check the hemorrhage, the therapeutic measures which are chiefly and urgently indicated, are those which act on the tumefied or obstructed organs.

With this view it will be proper to detract blood locally by means of cupping, or by the application of leeches over the right hypochondriac region, the left hypochondriac region, or the umbilical region, as the symptoms may indicate; and this local depletion should be repeated every second or third day, while the discharge of tar-like or blood-coloured matters continues. In some instances even, it may be requisite first to detract blood from the system by venesection, and then to employ the

local depletion ; but in the whole of this class of cases, the latter will prove indispensable. French physicians, and foreign practitioners in general, are in the habit of applying leeches to the anus in the treatment of this form of *melaena*, in order to empty the hemorrhoidal vessels, and thereby the mesenteric and intestinal vessels. There is little doubt that this method of depletion is, physiologically speaking, a more direct means of emptying the intestinal vessels than that by leeches applied over the belly. In this country, however, it is from various causes not often practised, and therefore seldom effectually done. Whenever it can be adopted, however, it may be done with the confident hope of insuring its physiological effects ; and in a few days therapeutic results will undoubtedly follow.

In general, under this method of treatment, unless the liver or spleen, or both, be very much enlarged and indurated, the discharges of blood become much less copious and less frequent ; the pains in the abdomen are abated or removed ; and the sense of distension is diminished, and feculent discharges take place. If, however, this be not the result, it may be proper to inject into the intestinal canal cold water, in order to arrest the discharge of blood, while leeches are again applied to the abdomen, or blood is drawn by cupping.

The revellent effect of blisters may also be attempted.

In some of these intestinal hemorrhagies, it is of advantage to act on the kidney by suitable diuretics. One of the best in this state of matters is foxglove, given either in tincture or in substance. In the latter case, the best plan is to give twice daily, a pill consisting of one grain of powder of foxglove, and one-fourth or one-half of a-grain of opium, with as much aromatic confection as constitutes a pill of moderate size.

In all persons distressed with vomiting of blood or discharge of blood from the bowels, a very distressing and troublesome symptom is flatulent distension. With the view of relieving this symptom, I have in general exhibited one or other of the alkalies to considerable extent. After trials with the subcarbonate of soda and *aqua potassæ*, I found that carbonate of ammonia answered upon the whole best, and seemed after it was taken, for some time, to exercise considerable effect on the hemorrhagic disposition. In general, after it had been employed, in conjunction of course with cathartics and local depletion, it was observed that the hemorrhagies recurred less frequently, were

less copious, and subsided more speedily. Carbonate of ammonia may be given with this intention, in doses of from three to five grains, three or four times daily, with two or three grains of rhubarb in each dose.

By some practitioners, who look more at the symptom than its cause, and who are more solicitous to check the hemorrhage than to remove the morbid state of the vessels on which it depends, it has been a practice, not unwonted, to give acetate of lead and opium in cases of gastric or intestinal hemorrhage. Under the use of this remedy the hemorrhage has sometimes subsided, as it does under the use of other remedies, and often without any remedies whatever. I will not say that acetate of lead and opium is always a useless or a hurtful medicine; but I believe that its indiscriminate employment in this kind of hemorrhage is injudicious and not very rational. In the early stage of the disease, while much vascular congestion is present, it is manifestly not required, and rather contraindicated. In the advanced stage of the disorder, when the congestive symptoms have been removed by depletion, it is scarcely required, and may be dispensed with for remedies better suited to the nature of the distemper.

§. IV. Piles. Hemorrhoids. *Hæmorrhagia Recti*; *Hæmorrhoids*; *Hæmorrhoides*. *Fluxus Hæmorrhoidalis*. Les Hemorrhoides.

Wenceslai Trnka Historia Hæmorrhoidum, Tom. i. 8vo. Vindobonæ, 1794.—Recamier, Essai sur les Hemorrhoides, Paris, 1800. 8vo.—James Ware, Chirurgical Observations on the Eye, &c. and on the Treatment of Hemorrhoids. Second Edit. Two vols. 8vo. London, 1805.—De Larroque, Traité des Hemorrhoides. Paris, 1812. 8vo.—Chaussier, Dissertation sur les Hemorrhoides. Paris, 1814.—Practical Observations in Surgery and Morbid Anatomy, illustrated by Cases, &c. By John Howship, M. R. C. S. London, 1816. Chapter iv. Section 6. On Hemorrhoidal Diseases, p. 308.—Observations on Hemorrhoidal Excrescence, by John Kirby, A. B., &c. Dublin, 1817. 8vo.—Montegre des Hemorrhoides, ou Traité Analytique de toutes les Affections Hemorrhoidales. Paris, 1819. 8vo.—A Practical Treatise on Hemorrhoids or Piles, Strictures, and other important Diseases of the Rectum and Anus, &c. By George Calvert, M. R. C. S., &c. London, 1824.—Additional Observations on the Treatment of certain severe forms of Hemorrhoidal Excrescence, illustrated by Cases, &c. By John Kirby, A. B., Lately President of the Royal College of Surgeons in Ireland, &c. Dublin, 1825. 8vo. Pp. 145.—A Treatise on the Malformations, Injuries, and Diseases of the Rectum and Anus. By George Bushe, M. D. New York, 1837.

Different definitions of hemorrhoids or piles are given by physicians and by surgeons; and according to the stage of the

disorder. If we take a comprehensive view of the disorder, it may be said that, whenever an individual is attacked with a sense of heat, itching, and pain at the anus or in the rectum, with occasional tenesmus, or the desire to go to stool, followed by slight swelling, general or partial, and a discharge of serous or sero-sanguine fluid, he is affected with hemorrhoids or piles.

It is perhaps impossible to imagine a more fit example to illustrate the general accuracy of the pathological principle which I attempted to establish in the beginning of this chapter, that even the active hemorrhagies are symptoms and effects of a previous morbid state of the circulation of the part, than what is furnished by the history of piles. In most cases of the distemper, when it makes its first appearance, its presence is indicated by the heat, itching, tenesmus, and pain, some time before any blood is discharged. In several cases even no blood escapes, at least nothing but a serous or sero-sanguine fluid, which only tinges the linen. But in the meantime, the heat, itching, pain, and tenesmus continue to increase, causing the patient to believe there is some foreign body sticking in the anus or rectum; and at length he feels, at one side generally of the anus, one or two minute, prominent, but very tender, and painful points slightly elevated, and in general moistened by a serous fluid. These small bodies increase in size, become more hot and painful, and, besides the serous fluid which incessantly oozes from them, at length, when the patient is at stool, he finds a little blood is discharged, and at the same time the painful itching and sense of a foreign body at the verge of the rectum is more distinct and urgent. In some instances, after these symptoms have continued for a few days, or a week or two, they subside without becoming worse. In other instances, however, they either return, or the pain, heat, and little swellings continue or increase, with constant oozing of serous or sero-sanguine fluid, and the occasional discharge of blood at stool.

In the early and incipient stage of the distemper, the patient does not always or necessarily present febrile symptoms. He has, however, dryness of the mouth and tongue, thirst, some feelings of distension in the belly, flatulence, constipation, not unfrequently very obstinate, and scanty urine, which deposits a sediment either of lithic acid, or the phosphates in some instances. As it advances, however, and more especial-

ly if it returns, while the patient eats and drinks freely, and takes no means to alleviate the local symptoms, he generally begins to suffer other complaints, which show that the disorder is producing its effects on the system at large. He is cold, or has frequent chills, with coldness of the extremities and dry skin. He feels also more or less weight and pain in the frontal and coronal regions of the head, and sometimes giddiness; sickness or even vomiting; constriction at the epigastric region, and between the hypochondriac region; precordial anxiety, palpitation, or irregular and sometimes intermittent action of the heart; and a considerable degree of distension in the hypogastric region, pain and weight in the loins and hips, and fulness in the site of the lower end of the rectum. At the same time the pulse is a little more frequent than natural, from 88 to 96, contracted and hard; and the breathing is limited and a little hurried.

The local symptoms become also aggravated. The pain and weight at the anus and within the rectum are increased; tenesmus is constant, and the patient complains of a peculiar pricking sensation, as if a bone or sharp-pointed substance were impacted in the bowel, while the sero-mucous oozing increases. Even micturition may become painful.

In this state, in general, the patient is unable to move about, and being compelled to observe rest more or less continuously, either the general febrile symptoms subside, and with them the feelings of local uneasiness; or the occasional discharges of blood at stool are followed by such alleviation, that at length the symptoms of heat, pain, and itchiness, are much abated, or altogether removed. The small bodies also diminish in size, but seldom totally disappear; and whenever the bowels are emptied, the patient is aware of several of the sensations of the original attack.

This is the ordinary course of an attack of piles, as it takes place in persons in the middle period of life. It is now requisite to advert to some circumstances which could not be previously noticed.

Though the minute tumours may be situate at the verge of the anus, or on that delicate cutaneo-mucous surface where the mucous membrane is attached to, and conjoined with, the skin, they may be also formed entirely within the anus, so as not to be felt or seen externally. In the former case, that is,

when formed in the cutaneo-mucous membrane, they form external piles; (*hæmorrhoides externae*;) in the latter they constitute internal piles; (*hæmorrhoides internæ*.)

It is not always that either of these forms of hemorrhoidal tumours discharge blood. Most usually, at first, they discharge a thin but viscid sero-mucous fluid, which exhales a peculiar odour, and of which the patient is himself sensible. In this state the discharge is named *hæmorrhoids alba*, and the tumours are called blind or shut piles, (*hæmorrhoides cæcae vel clausæ*.) When they discharge blood either at stool or continuously, that is, when the serous fluid is converted into sero-sanguine fluid or actual blood, they are denominated bleeding, flowing, or open piles, (*hæmorrhoides fluentes vel apertæ*.)

It is easy to perceive that the last distinction is one rather in kind than in degree; and that the discharge of pure blood is merely a more advanced stage and more violent form of that state of the vessels which gives rise to the sero-mucous or serous discharge.

At first, it has been said, the discharge is a mere serous or sero-mucous oozing. Afterwards this is tinged with blood, and it generally stains the linen, and forms a sort of indurated crust round the anus, and down towards the perinæum, if the parts be not repeatedly and carefully washed. As the disease proceeds, blood, almost pure, is discharged every time the patient goes to stool; and, in more serious forms, it is not only discharged at that time, but continues to ooze incessantly.

The blood is in general of a bright vermilion red colour, very like arterial blood; but, in some instances, it is of a dark or slightly modena colour.

The quantity discharged varies at different periods of the disease, in different individuals, and according to the nature and effects of the method of treatment employed. It may vary in this manner from one or two drachms to three or four ounces, and in some instances, a pound or two may be lost each time the patient goes to the water closet. The discharge of blood is always followed by more or less relief to the pain, itching, weight, and tension of the parts; but when it proceeds to a great extent, it is liable to induce great faintness and alarming weakness. When the discharge has gone on moderately for a time, it often subsides spontaneously apparently; but it may recur and continue for weeks, months, or even years. In those

cases in which it continues so long, it may be regarded as habitual; and in general, considerable changes have taken place in the mucous membrane of the rectum, and in the cutaneous mucous membrane of the anus, before the disease has attained this character.

PATHOLOGY OF HEMORRHOIDS.—Imperfect knowledge of anatomy, and erroneous physiological notions, gave rise to the opinion, that the blood of the hemorrhoidal discharge proceeded from certain veins of the rectum, which, according to the same system, were denominated hemorrhoidal veins. These were imagined to be in a varicose state; and as the part is dependent, and the veins not provided with valves, accumulation of blood within them was believed so much the more likely to take place, and cause distension and rupture. This doctrine, which was formerly taught by Wiseman* and other contemporaneous and subsequent authors, and supported by Morgagni,† Portal,‡ Heberden,§ Baillie,|| and Sir Everard Home, has been very generally received as well founded. Cullen, indeed, without denying the possibility of distension of the veins, inferred that the hemorrhage is commonly from arteries; and Portal, in stating the usual doctrine, was disposed to infer, from anatomical considerations, that the blood of the hemorrhoidal discharge proceeds rather from arteries than veins.¶ This natural view, however, appears to have been overlooked, probably because the hemorrhoidal swelling was regarded with more attention than the congestion from which it arose; and because most usually, when seen by practitioners, the disease appeared in the form of dark-coloured or bluish tumours at the verge of the anus.

In order to form just ideas on the nature and source of the hemorrhage, it is requisite to examine the state of the parts in the early stage of the disease.

When this is done, it is found that the rectum and the cutaneo-mucous membrane is very vascular, and other vessels much distended and loaded with blood. At first, from the sur-

* Eight Chirurgical Treatise, by Richard Wiseman, Sergeant Surgeon. London, folio, 1766. Treatise iii. p. 211.

† De Sedibus Morborum, Epist. xxxii. 10, &c.

‡ Anatomie Medicale, Tom. iii. p. 452.

§ Commentarii de Morborum Historia et Curatione, Cap. xlv. p. 180.

|| Morbid Anatomy, apud Works, Vol. ii. Chapter viii. London, 1825, p. 161.

¶ Anatomie Medicale, Tom. iii. p. 2-9.

face of the membrane in this state oozes the sero-mucous fluid; and then blood is seen to exude or be exhaled from it, not by any large or single vessels, but from an extensive oozing surface. But while blood is oozing in this manner from the mucous surface of the rectum, and the cutaneo-mucous surface of the anus, the vessels of the submucous tissue are also enlarged and distended, and blood is also effused or extravasated in the submucous and subcutaneous cellular tissue. In this manner these tumours, which consist at first of enlarged and distended vessels, consist eventually of vessels and extravasated blood and lymph.

This opinion on the nature of the hemorrhoidal tumours has been adopted by Latta, Benjamin Bell, Callisen, Monteggia, Chaussier, Larroque, Delpech, and other modern authors, all of whom agree in representing it as consisting chiefly of extravasated blood; and it has received confirmation from the researches of Howship, Kirby, Montegre, and Bushe.

Chaussier and Larroque showed that these bodies consist chiefly of a reddish homogeneous parenchyma or filamentous tissue, which discharges when pressed pure bloody serum or limpid serous fluid, and which may be rendered white by maceration. Larroque further maintained, that, though there may be varicose veins, this cellular parenchyma is never wanting.

Mr Howship found upon dividing these tumours, after maceration for a month in spirit, that the tumour was produced by blood, but neither by a varicose vein, nor effusion from a varicose vein, but from the capillary vessels distributed in the cellular membrane, about the extremity of the rectum and the external margin of the sphincter. He inferred also that the blood had been effused at different periods, forming so many little cysts, because the clots in each were lighter or darker in colour according to the length of the period after the date of effusion. In the specimens examined by Mr Howship the coagula were disposed in concentric layers, the internal being the brightest in colour, the external of a darker tint. In one of these tumours he counted eighteen coagula.*

Similar results were obtained by Mr Kirby, with the single exception that the cysts, instead of containing concentric lami-

* Practical Observations in Surgery and Morbid Anatomy, by John Howship. London, 1816, p. 308.

næ of coagula, appeared to be separated by partitions. The coagula were denser externally than internally.*

Dr Bushe injected the tumours formed within the rectum, and found them to consist both of arteries and veins, the latter being largest, but always perfectly healthy.†

In short, it must be admitted, that though the veins of the rectum may become varicose, yet they do not in that state necessarily constitute piles. Varicose veins may exist and constitute one disorder of the rectum, causing occasional hemorrhagies from the bowel; but they are not necessary to the formation of the true hemorrhoidal state. This consists first in vascular congestion of the rectum, the cutaneo-mucous membrane, and their subcutaneous cellular tissue, and the morbid secretion of blood, serum, or sero-sanguine fluid from the mucous surface, and into the submucous cellular tissue.

To understand this distinctly it is requisite to remember four circumstances; *first*, that the inner or free surface of the rectum is a mucous membrane liberally supplied with blood-vessels from three large arterial trunks; *secondly*, that its outer or attached surface is connected to the contiguous parts by a peculiar cellular membrane, which is described as very loose and very extensible, and which, even in the most slender subjects, is copiously supplied, near its lower extremity, with fat; *thirdly*, that the lower extremity of the bowel is united to the skin by a soft delicate membrane, intermediate in structure between skin and mucous membrane; and which I call cutaneo-mucous; and, *fourthly*, that the lower extremity or termination of the gut is furnished with two muscular organs, one of which retains it constantly closed, unless at those times when its power is overcome by the superior resistance of the diaphragm and abdominal muscles; while to the other is allotted the function of occasionally raising the extremity of the bowel, or drawing it, as it were, within its own cylinder. To this arrangement of parts are to be ascribed many of the peculiar characters which distinguish the hemorrhoidal disease, whether in its constitutional or its local form.

The mucous membrane of the rectum, like every other mucous membrane, is liable, from the operation of sundry causes,

* Additional Observations on the Treatment of certain severe forms of Hemorrhoidal Excrescence, by John Kirby, M. D., &c. Dublin, 1825. P. 113 and 114.

† A Treatise on the Malformations, Injuries, and Diseases of the Rectum and Anus, by George Bushe, M. D. New York, 1837, P. 152.

to unusual distension and injection of its vascular system; and as this never takes place without injection of the contiguous tissues, the submucous filamentous tissue participates in the disorder. In this state one of two results may ensue. Blood may be effused either from the mucous surface of the rectum, or from the submucous capillaries into the cellular tissue; or both may take place simultaneously. That the veins of the rectum are never unusually distended or varicose, and never discharge fluid blood, can by no means be maintained;* but it is equally certain that this does not produce the bloody discharge of genuine piles, which is known to issue from the injected exhalants, or minute capillaries of the mucous membrane of the bowel. That this is the condition during the hemorrhoidal attack, is established not only by the phenomena exhibited by the bowel in this morbid state, but by what pathological anatomy teaches in regard to the hemorrhagies of mucous membranes in general.

When the ordinary hemorrhoidal attack has recurred repeatedly, so as to form tumours, the mucous membrane of the rectum is at once extruded and elongated, its vessels increase in size, and become more numerous, and if they burst may discharge blood into the submucous cellular tissue, as above noticed; but it is almost invariable that lymph is effused; and this undergoing coagulation, and afterwards a degree of organization, gives the tumour the firm, fleshy character by which it is distinguished. In the newly developed vessels blood is deposited, not as in ecchymosis, but in regular and isolated patches; and as the effusion of lymph counteracts extravasation through the cells, this is, therefore, never observed in the genuine hemorrhoidal tumour. It hence results that these tumours consist partly of blood not exactly extravasated, but rather accumulated, and stagnating in enlarged and distended blood-vessels,—partly of coagulable lymph effused in the course of repeated attacks of inflammation,—and partly of minute blood-vessels either newly developed, or the ordinary capillaries of the mucous membrane greatly enlarged.

This disorder may, nevertheless, be complicated or associated with a varicose state of the veins of the rectum, and also with various morbid conditions either of the arteries or the veins, which may give some verisimilitude to the hypothesis al-

* Baillie's Morbid Anatomy, p. 182. Article Piles.

ready noticed. One source of hemorrhage is not uncommon ; viz. the circumstance of a single artery affected with disease, as inflammation or ulceration, being repeatedly opened and discharging considerable quantities of blood. In other instances, the rectum, or rather its vascular system, may be converted into a series of erectile vessels, and in this manner become the source of repeated hemorrhage.

When *hæmorrhoids* has recurred very often, and has given rise to repeated attacks of swelling and pain, and the other phenomena of inflammation, it is liable to induce a number of secondary effects. One of the most common is a relaxed or flaccid state of the cutaneo-mucous membrane, which thereby hangs in pendulous folds, and forms a sort of loose pile-like set of tumours. The skin is in such circumstances dark-livid or bluish ; and is liable to be attacked by secondary inflammation. Another result is, that in some cases the submucous and subcutaneous cellular membrane round the rectum and anus may be attacked with inflammation, which proceeds to suppuration ; and then a small opening taking place beyond or near the verge of the anus, a sinus or rather fistula is formed. This is one of the modes in which fistula, not having, however, always an internal opening, takes place.

It is believed that the occurrence of hemorrhoids is useful in guarding against several dangerous disorders. It is matter of observation, that persons in whom this disorder takes place, do not enjoy very good health when the discharge has been suddenly suppressed or has disappeared, and are liable to attacks of hæmoptysis, apoplexy, or palsy, *meningitis*, disease of the liver or stomach, and in some cases to symptoms of formidable disease of the heart. This does not, however, prove that the hemorrhoidal discharge is either a useful or safe distemper. It merely shows that the same disposition of body, which causes hæmorrhoids, may cause a number of other distempers.

ETIOLOGY OF HÆMORRHOIS.—The causes of the hemorrhoidal distemper are the same as the causes of hemorrhagies in general. Besides the influence of the plethoric disposition, induced by full living and sedentary or indolent habits, it is observed to take place more commonly in persons of full corpulent figure than in the lean, the spare, and the active, and more frequently in those in whom the intestinal canal is habitually bound than those in whom the alvine discharges are regular.

Derangement, in short, of the digestive organs and the alimentary function, especially that sort of derangement, in which larger quantities of aliment are taken than the blood-vessels can apply to the purposes of nutrition, is a fertile source of hemorrhoidal disorders and their effects; and to this, doubtless, must be referred another circumstance, that hemorrhoidal affections are common in persons of gouty disposition; and the collateral fact, that their sudden disappearance or retrocession in plethoric or gouty persons is replete with the utmost danger.

Conversely, it is said that very low and scanty diet, or habitual abstemiousness, is not less productive of the disorder. Thus, in Spain, Italy, and other Catholic countries, where, from motives of penance, or the religious observance of seasons of fasting, many individuals confine themselves to meagre and scanty diet, the torpid and constipated state of the bowels, which ensues, is said to be favourable to the formation of piles. In this manner, Morgagni explains the fact, that Sarpi, afterwards known as the celebrated Father Paul, was attacked when young with constipation, piles, and troublesome prolapsus.

It is generally said to occur not before puberty, and to be most usually prevalent between the 35th and the 64th years. But Trnka has collected from many authors instances of the hemorrhoidal discharge taking place, not only under the 34th year, but under the years of puberty, and at 11, 10, 9, 8, 7, 6, 4, 3, and even 1; and Heberden appears to have seen the distemper at the 5th year. All that can be maintained, therefore, is, that the disorder is much less likely to take place before puberty than after that period.

Males have been, by most writers, allowed to be more subject to the disease than females. It is believed that the periodical uterine secretion tends to counteract that state of plethora which is understood to be favourable to the formation of the disorder. It is, accordingly, observed, that when the disease takes place in females, it is chiefly when the catamenial secretion is suppressed, and among those who live rather freely, during pregnancy, and it is added those *quae veneri nimium sunt deditae*. It is further added, that even in some females who menstruate regularly, the distemper takes place and proceeds to great extremity. Thus, Sennert mentions the case of a lady of rank, of the sanguine temperament, however, and subject to a hypochondriacal disorder, who every month, about the four-

teenth day after the menstrual secretion, suffered a hemorrhoidal attack, and he adds that Leonora, Queen of France, was liable both to the uterine secretion and the hemorrhoidal. The disease is, nevertheless, by far most frequent after the cessation of the menstrual secretion.

With regard to the occurrence of hemorrhoids during pregnancy, it is requisite to say, that the presence of the gravid womb produces in the rectum a number of disorders, and of these genuine hæmorrhoids is only one. Thus it gives rise to *procidencia* and prolapse of the rectum, and causes a constant fulness of the veins, not only of the rectum, but of the whole of the lower extremities. In this case, therefore, the veins are liable to become, and do become, so distended, that the whole capillary system of the rectum is injected and loaded, and very often, if there be *procidencia*, which sometimes takes place, the lower end of the bowel is protruded in the shape of a bluish ring, or rather an annular mass of bluish tumours. In this state the impediment to the return of the blood by the veins, conjoined with the *procidencia* of the rectum, induces a complicated form of hemorrhoidal disorder peculiar to pregnant females. The disease is not the genuine inflammatory and hemorrhagic hæmorrhoids, but a congested or engorged and turgid state of the vessels of the rectum, which may give rise to hemorrhage, but which differs from true hæmorrhoids, in being induced solely by mechanical obstruction to the return of the blood.

Other predisposing causes are found in the presence of disease of the liver, especially induration or hypertrophy, disease of the spleen, and disease of the pancreas, all of which, but especially the first, are conceived, by impeding the return of the venous blood, to produce more or less congestion of the veins of the rectum, and eventually of its arteries.

Abdominal tumours are conceived to operate in the same manner. It may be said, however, regarding the whole of the causes now enumerated, that none of them would alone produce piles, properly so denominated, but rather enterorrhagia or intestinal hemorrhage. They would unquestionably cause venous distension and congestion, and thereby capillary distension and congestion, and perhaps a discharge of blood under favourable circumstances; but they would not necessarily produce genuine piles. All these causes act on the hydraulic proper-

ties, but not necessarily on the physiological properties of the blood-vessels.

Lastly, a disposing cause of some moment is hereditary disposition. To this cause much importance has been attached by Schenke,* Alberti,† Behr,‡ and Trnka, who, however, appears to ascribe to it greater influence than it really deserves. All that observation justifies in this respect is, that the hemorrhoidal disease, being often allied with the full and rather luxurious mode of living, is, like several other kindred disorders, as gout and hypochondriacal affections, capable of being transmitted by hereditary descent.

Hemorrhoidal disorders are said to be more prevalent in warm than in temperate or cold climates; and they are more frequent in the spring and summer than in winter. In warm countries, nevertheless, other causes than mere heat may contribute to the production of the disorder. Among exciting causes are enumerated hot and stimulating articles of food and drink, as the stronger wines; irritating medicines, as aloes; the long-continued use of laxative mineral waters; emmenagogue medicines; constipation, especially if habitual, causing the fæces to be hard and scybalous; pregnancy; mental emotions, as anxiety, panic or alarm, or grief; long-continued travelling in carriages or on horseback; the effluvia of necessaries, and the drains connected with them; and exposure to cold or moisture.

In this list of exciting causes, it is often difficult to perceive the relation of cause and effect. Too much importance, perhaps, is attached to the irritative properties of aloes and other cathartic medicines, and also to emmenagogues. That these substances are irritants cannot be denied; but that they really produce hemorrhoidal affections is very doubtful. It is well known that colocynth and aloes, both of which have been accused of producing hemorrhoids, are habitually taken by many persons during the course of a long life, yet without inducing in these persons any thing like a hemorrhoidal attack. The true reason why these medicines appear to be occasionally productive of hemorrhoidal symptoms is the fact, that their use is rendered necessary by constipation almost habitual; and it is

* *Observationes Med. L. II. p. 1. Obs. 155.*

† *Dissert. de Haemorrhoidibus hæreditar. Halae, 1727. 4to.*

‡ *Select. Med. Francof. T.II. V. iv. art. 3, p. 277.*

the latter circumstance that is the true cause of the hemorrhoidal attack, and not the medicines used for its removal.

DIAGNOSIS.—Hemorrhoids must be distinguished from dysentery, from melæna, from varix of the rectum, from rupture of an artery or arteries, from inflammation, from *thymi, cristæ, condylomata*, and *fici*.

TREATMENT.—In the treatment of hemorrhoids, two circumstances require attention. As the disease is evidently the symptom and effect of a general habit or condition of the system, and this may often be observed to be connected with the gouty diathesis and the plethoric constitution, it is first requisite to consider the means calculated to prevent the disease from appearing, if it have not hitherto appeared, and if it have, to prevent it from recurring. With this view it is requisite not only to employ means calculated to obviate constipation, but means calculated to obviate plethora. The bowels must be kept regular by means of medicine and diet; all excess and full living must be avoided; and exercise ought to be taken regularly, and carried to a considerable extent daily.

Various laxatives have been recommended for fulfilling the first indication, and sulphur has got the character of being almost specific. It is nevertheless not very well suited for habitual use as a prophylactic. When it is determined to use it, it may be given to the extent of one scruple, or half a drachm with two scruples of the compound jalap powder. It is, however, often more convenient, and certainly not hurtful, for persons of hemorrhoidal tendency, to use the compound hyoscyamus pill, consisting of one grain of scammony, one of colocynth, one of aloes, and two of extract of henbane. The best method, however, is to accomplish this by diet; and persons threatened with the disorder should not only select such articles of food as facilitate the regular evacuation of the bowels, daily, but they should endeavour to acquire a habit of having the bowels emptied at a certain time daily.

It is further of great importance for hemorrhoidal persons to wash the anus daily with cold water and soap, and to have cold water or tepid water injected into the rectum once or twice a week.

By these means, but especially by due attention to diet and exercise, attacks of hemorrhoidal disorder may be in general obviated. Whenever the feelings of the patient show that the disease is threatening, for instance by the sense of heat, itch-

ing, tenesmus, or the feeling of a foreign body in the anus, or if the rectum is liable to be protruded during defecation, more decided measures require to be promptly adopted.

If the rectum be merely prolapsed, then sometimes rest alone is sufficient to replace it. But if the *procidencia* be accompanied with much pain, then blood should be drawn from the system to the extent of 18, 20, or 25 ounces; and a few hours after, in general, the prolapsed portion recedes of its own accord.

When the cutaneo-mucous membrane alone presents one or two prominent painful swellings, with heat and tenesmus, or when the interior of the bowel feels hot and sore, and sero-mucous or sero-sanguine fluid is discharged, if there be little or no rapidity of pulse, or lumbar pain, and when shivering does not ensue, then it may be sufficient to enjoin low diet for a few days, rest in the horizontal posture, and the use of small doses of castor oil, or sulphur and the compound jalap powder. At the same time it is necessary to wash the anus carefully with cold water twice or three times daily, and apply at intervals the lotion of acetate of lead.

When pain and swelling continue after these means have been used, it is requisite to apply to the most prominent tumours from 6 to 10 leeches, and afterwards warm fomentations and the emollient poultice.

When at any time it comes on with affection of the constitution, and is attended with disorder of the stomach and bowels, hot dry skin; foul tongue; slight quickness of pulse; headach, giddiness, &c. then it will be expedient to attempt to restore the healthy state of the circulation by full general blood-letting, evacuation of the intestinal canal, and the observance, for some days, of the antiphlogistic regimen.

General blood-letting to the extent of 20 or 25 ounces is indicated, not only by the symptoms of febrile disorder and the general plethoric and inflammatory state of the system, but by the intensity of the local complaint, which, if not moderated in this manner, is liable to terminate in profuse hemorrhage, with subcutaneous hemorrhage and inflammation of the subcutaneous cellular tissue. By full blood-letting, performed under these circumstances, not only is the disorder and its cause more easily and promptly removed, but the morbid changes which invariably take place in and around the rectum are prevented from ensuing. If one full blood-letting to the amount above

specified be not sufficient to accomplish these objects, then another of smaller amount, for instance, from 18 to 20 ounces, should be taken; and in general this will be followed by remarkable abatement in the heat, pain, swelling, and tenesmus, in the course of 24 or 36 hours, and at the same time subsidence of the febrile symptoms.

It sometimes happens that, under the use of these measures, the latter are removed while the local symptoms are not in a proportional degree abated. In this case, local bleeding by means of leeches, to the extent of from 6 to 10 applied to the anus, is the appropriate remedy. The bleeding should be followed by the application of warm poultices every second or third hour; and some prefer the turnip poultice.

It is of great moment, next to general depletion, to empty the intestinal tube gently but effectually. For this purpose it has been supposed that sulphur is almost specifically remedial in unloading without irritating the rectum; and united with cream of tartar (bitartrate of potass,) magnesia, sulphate of potass, or even extract of senna in the form of electuary, it forms one of the most valuable laxatives within our reach. Another mode of exhibition is the following. From 10 to 15 grains of sulphur, joined with any other of the laxatives now mentioned, have been recommended to be given; but in general, it is requisite to use double the quantity now specified, that is, from one scruple to half a drachm; and its efficacy will be augmented if it be conjoined with two scruples or one drachm of the compound jalap powder. In the same manner castor oil may be employed.

Along with the remedies now mentioned, it is of indispensable importance to employ diet calculated not only to allay inflammatory symptoms but to obviate costiveness. In general if the patient has sufficient firmness, he will find it expedient to abandon for a time the use, at least the free use, of animal food, and confine himself to a diet of milk, grain, eggs, and white fish occasionally, without butter if possible. Among such substances he must, by personal experience, make such a choice as will afford him a diet light, digestible, and, above all, that which will, by preventing costiveness, supersede the necessity of using much purgative medicine. By these means he will not only counteract the plethoric state of the system, which disposes to hemorrhage, but prevent the local congestion, which is liable

to take place in the lower end of the intestinal canal. Baked apples, stewed prunes, boiled rice and currants, or boiled barley and currants, have all been recommended as well suited for the bowels of hemorrhoidal invalids.

Besides the means now mentioned, it has been found convenient to employ various local applications of astringent or sedative characters, or both united, either with the view of alleviating pain, allaying irritation and tenesmus, abating swelling or restraining hemorrhage, or with the general intention of diminishing the sufferings of the patient.

The astringents most effectual and in most common use, are galls in the form of decoction or ointment, oak or oak-bark in the form of decoction, white vitriol in the form of lotion, injection, or ointment, alum in the form of lotion or injection, and sugar of lead in the form of lotion or injection. The only sedatives on which reliance can be placed, are decoction of poppy-heads and opium, in the form of watery solution, or reduced to powder and combined in ointment, with some of the astringent remedies, especially the galls or the sugar of lead. Great reliance was formerly placed on camphor for this purpose; and it was an ingredient in almost every local application for the relief of hemorrhoidal swellings. But its sedative powers are very doubtful; and as a more certain and not less safe remedy is found in opium, it is unnecessary to render our measures equivocal in their effect by the use of a substance at best inert. In the early stage of the disorder, while pain and tenesmus are urgent, an ointment consisting of two ounces of spermaceti ointment or hogs-lard, and two scruples of opium reduced to powder, and softened by water, forms a good anodyne application. In the advanced stage, when pain and tenesmus are abated, an ointment consisting of two drachms of galls, six drachms of hogs-lard or acetate of lead ointment, and one drachm of opium in powder, forms a very useful anodyne astringent ointment.

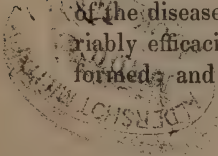
In the employment of these local remedies, however, it is requisite to take care that general measures be not neglected, and that the discharge, if already established, or about to be established, be not too suddenly suppressed by the repellent effect of cold or astringent applications. It has sometimes happened even that the pain, heat, and swelling have suddenly disappeared, either spontaneously or under the use of cold applications;

and this has been attended or followed by symptoms of *meningitis*, apoplexy, palsy, hæmoptysis, pneumonia, or *gastritis*, or violent spasmodic pain of the stomach or bowels.

In each and all of these cases it is necessary immediately to detract blood from the system to sufficient amount to abate or remove the urgent symptoms of affection of the brain, lungs, heart, or stomach, as it may be, and even to repeat the evacuation, and employ other means, exactly as if these affections had not been preceded by the hemorrhoidal attack. Foreign practitioners are partial, in these circumstances, to the application of leeches to the anus. But the remedy is often inert and tedious, and does not act with sufficient promptitude on the affected organ.

Internal hemorrhoids, situate within the cavity of the rectum, may, either of themselves or with a varicose and distended state of the veins, become large and bulky; and, as in this state, they are usually protruded in the efforts made by patients in emptying the bowels, their size and frequent protrusion produce at length *prociencia*, or inversion of the *rectum*, the aperture and cavity of which they more or less completely shut, whence results a habitual and distressing infirmity.

In this state they are liable not only to inflammation from the constant exposure of the mucous surface, and the constriction caused by the sphincter, but to strangulation and gangrene from the occasional violence of the constriction of this muscle. In the former case, they cause in the rectum and at the neck of the bladder violent irritation, and a painful sense of weight, which allow the patient neither to sit nor stand with comfort. This inflammatory swelling may terminate in resolution, suppuration, induration of the parts, or gangrene. To obviate the inflammation and promote resolution the patient should be placed in the horizontal position, and leeches should be applied in considerable number to the protruded parts, and afterwards warm fomentations, either of the poppy capsules or the chamomile flowers, or both conjoined. When by this means the swelling of the protruded portion is diminished, gentle and cautious attempts should be made to reduce it, which will be the most effectual means of relieving pain, and shortening the duration of the disease. As, however, not even these means are invariably efficacious, a full bleeding from the arm should be performed; and this, I can assert from experience; to be the most



certain and successful method of abating the sufferings of the patient, and finally removing the disease, and preventing it from leaving bad consequences.

If the inflammatory symptoms be violent, and the protruded bowel have not been reduced, the forcible contraction of the sphincter upon the loaded bowel, acting like a tight ligature upon the bulky tumours, no longer reducible, strangles the portion extruded. The parts become black or livid; the ring formed by the prolapsed intestine is infiltrated with blood, and becomes speedily gangrenous. The patient labours under febrile symptoms, sleeplessness, suffers violent pains, referred to the bladder, the perineum, and even the belly; and, unless means be adopted, by scarification and depletion, to diminish the bulk and the tension of the parts, death takes place. In other instances, the part dies instantly, while the inflammation of the neighbouring parts is not sufficiently violent to prove fatal. Those who have undergone this severe accident are delivered in future from their hemorrhoidal tumours after the detachment of the dead sloughs; but they generally suffer under considerable contraction of the rectum.

The other terminations and sequelæ, as abscess, fistula, sinuses, &c. belong to the department of surgery.

When, under the use of blood-letting and the adoption of the antiphlogistic regimen, followed by the cautious employment of astringents, the violence of the discharge has abated, means should be taken, by suitable diet and management of the digestive process, to prevent a relapse.

§. V. Renal Hemorrhage. Bloody Urine. *Haematuria*; *Mictus Cruentus*. *Nephrorrhagia*. *Cystirrhagia*. *Prostatorrhagia*. *Urethrorrhagia*. Pissement de Sang, Gall.

A discharge of blood from the urinary organs may take place from various causes, and under different circumstances.

a. In the *first* place, it may take place from the kidney, either in consequence of inflammation of that gland, or in consequence of concussion, or in consequence of laceration, from the presence of a renal calculus. That inflammation may cause renal hemorrhage is undoubted. Portal mentions the case of a young girl, who, after suffering excruciating pains in the right loin, voided by the urethra a pint of blood. Upon inspecting the body, Portal found the right kidney greatly swelled, very

red, and softened in its substance, which was infiltrated with purulent matter. The pelvis contained a very irregular round stone, as large as a large pea, and clots of blood were found in the ureter and bladder.

In most cases of renal inflammation, when the process proceeds to suppuration, blood is mixed with the purulent matter; and, in general, what is found in the pelvis and dilated *calyces* of the gland is a brownish-coloured fluid, strongly animalized, and evidently containing much blood. This is confirmed by the case now mentioned, which further shows that the accident is most common in inflammation, from the presence of calculus. Many authors, indeed, maintain, like Heberden, that renal hemorrhage is induced chiefly, if not solely, by the presence of urinary concretions, principally the mulberry, in the kidney. This circumstance, however, is not allowed to be necessary either by Howship, (*Practical Observations on Diseases of the Urinary Organs*, p. 9,) or Prout, (*An Inquiry, &c.* p. 296,) both of whom had seen cases of bloody urine without proof of the presence of any urinary secretion.

Another frequent cause of bloody urine is the shock or concussion produced by blows on the loins, or falls. In this case Heberden is of opinion, that veins or arteries may have been torn open by the violence of the shock. It is most common in falls from a great height.

After the irritation of various other agents, however, bloody urine may ensue. Thus the use of the oil of turpentine irritates the whole of the urinary passages so much, that it may cause a discharge of blood either from the kidney or the neck of the bladder; and the irritation of the common blistering fly is in certain persons, especially if the skin be thin, or the cuticle abraded, followed by the same result. In such circumstances, we know from the appearances presented by the dead body, that the irritation takes place chiefly in the kidney, but may extend to the bladder.

Blood is also found in the urine, and is known to be discharged from the kidney in certain severe forms of scarlet fever. In cases of this kind the urine is very scanty or totally suppressed; and blood, more or less pure, is voided. Even in dropsy succeeding scarlet fever, I have often seen red blood at the bottom of the urine voided.

The main object of the practitioner is to distinguish in any

given case of bloody urine, whether the blood proceeds from the kidney or the bladder. That the former is the source will be rendered probable by the fact of pain in the loins, generally with shivering, having preceded or attended the discharge, by the blood voided being equally diffused through the whole urine, giving the urine a dark-brown colour, by coagulated fibrin in the shape of worms, that is, bodies moulded in the ureter being found in the urine; by the urine being discharged in an uninterrupted stream; and, above all, by the presence of symptoms of several calculi, or by such calculi having been voided.

b. Bloody urine may also be discharged from the bladder in consequence of inflammation of its internal coat, especially its neck, or a peculiar turgescence and congestion of the vessels of the neck of the bladder, to which the name of vesical hemorrhoids has been applied. This takes place chiefly in gouty persons, and those who have hemorrhoids of the rectum. The discharge of blood from the bladder is also a common symptom in cases of vesical calculi.

When blood or bloody urine proceeds from the bladder, the blood most generally comes away in greater or less quantity at the end only of the urinary discharge, while the urine which is voided first is almost perfectly clear. In general, also, symptoms of vesical calculus, or other disease of the bladder, are present.

An occasional cause of vesical hemorrhage is the growth within the bladder of fungous tumours, which, as they enlarge, become congested with blood-vessels, which at length burst, and pour out large quantities of blood. Of this source of vesical hemorrhage several cases are recorded; but a very good one, with an account of the appearances on dissection, is given by Mr A. Copland Hutcheson, in his Practical Observations on Surgery, (Chapter vii.)

c. A third source of bloody urine is the prostate gland, which, when enlarged and indurated, or affected with hypertrophy, is occasionally also the source of hemorrhage. The veins and its vessels in general are liable to become very much loaded with blood, and then occasionally give way and discharge considerable quantities. This hemorrhage it is often difficult to restrain.

d. A fourth source of bloody urine, or rather blood discharged from the urinary passages, is the urethra, which, when in-

flamed or lacerated, or affected with stricture, has been known occasionally to discharge considerable quantities of blood. This it does the more readily that the *corpus spongiosum* is sometimes opened. Both of the last forms of hemorrhage are liable to take place in persons with disease of the prostate gland and urethra.

The treatment of these different kinds of hemorrhage must be conducted upon the general and particular principles already specified. Besides blood-letting, general and local, it is advantageous to use astringents, as tincture of muriate of iron, bucku leaves, the leaves of the bear's whortleberry, &c.

§. VI. Uterine Hemorrhage; Profuse Menstruation; Abortion.

Flooding. *Menorrhagia. Hemorrhagia Uteri. Metrorrhagia.*

Les Maladies des Femmes Grosses et Accouchées Comparée, par Maistre Francois Mauriceau, Maitre en Arts et Chirurgien juré de Paris. A Paris, 1673. —Le Pratique des Accouchemens, par Paul Portal. Paris, 1685.—Pratique des Accouchemens, par M. Peu. Paris, 1698, 8vo.—Cases in Midwifery. By W. Giffard. London, 1734,—A Treatise on Female Diseases, &c. By Henry Manning, M.D. The second edition. London, 1775. 8vo. Chapter i. Chap. iii. Chap. xiv. Sect. ii. Flooding, p. 328; Abortion, 334.—On Child-Bed Fever, Uterine Hemorrhage, Convulsions, &c. By J. Leake, M.D. London, 1777, 8vo.—On the Diseases of Women. By J. Leake, M.D. 2 vols. 8vo. London, 1781.—An Essay on the Uterine Hemorrhage which precedes the delivery of the full-grown Fœtus. By Edward Rigby, M.R.C. Surgeons, London. London, 1784, 8vo.—Introduction to the Practice of Midwifery. By Thomas Denman, M.D. London, 1788–1795, &c. London, 1801. —De Causis insertionis Placentæ in Uteri Orificium ex novis circa generationem observationibus et hypothesibus declarata. Auctore Frid. Benj. Osiander, M.D., &c. Goettingæ, 1792. Apud Brerac Syllogen, Vol. i. Ticini, 1797. —Practical Observations on the Uterine Hemorrhage, with remarks on the Management of the Placenta. By John Burns, Lecturer on Midwifery, Glasgow. London, 1807. 8vo.—On Uterine Hemorrhage. By Duncan Stewart, M.D. London, 1816, 8vo.—Researches on the Pathology and Treatment of the most Important Diseases of Women. By Robert Lee, M.D., F.R.S., &c. London, 1833, 8vo. pp. 220.—Remarks on the Literary History of Uterine Hemorrhage, proceeding from attachment of the Placenta to the Os Uteri. By Robert Renton, M.D., &c. Edin. Med. and Surgical Journal, Vol. xlviii. p. 243. 1837.—An Historical Account of Uterine Hemorrhage in the latter months of Pregnancy. By Robert Lee, M.D., &c. Ibid. Vol. li. p. 380. 1839.

HEMORRHAGE from the womb may take place under various circumstances; and the peculiar nature of these circumstances forms a very good ground of distinction. If we refer to this head the discharge of blood or bloody fluid only, it may be said that it differs according as it takes place from the womb in

its unimpregnated, its impregnated, and recently delivered state. In the first case, it forms the disease of *Menorrhagia*, or immoderate menstruation, properly so called; in the second, it constitutes uterine hemorrhage; or abortion, according to its effects; and in the third, it constitutes the extreme degree of the lochial discharge, or puerperal uterine hemorrhage, according to the extent to which it takes place. This arrangement, therefore, includes the *red* or ordinary *Menorrhagia*, the *abortive Menorrhagia*, and the *lochial Menorrhagia* of Cullen, which are the only genuine and idiopathic examples of the disease. We may add, however, another, namely, the hemorrhage which takes in organic diseases of the womb or of the utero-vaginal membrane; but it must be kept in mind, that this is purely symptomatic, and depends on a very different pathological cause from that which gives rise to the others.

I. *Hemorrhage from the Womb in the unimpregnated state.*—In the ordinary state of health, it is known that the female of the human race is liable to a discharge of blood-coloured fluid from the uterus or mucous surface of the womb, taking place nearly every four weeks, or lunar period. In the healthy state of the system this is not copious. It amounts, perhaps, to about from one to six ounces, and it continues about two or three days. It is not blood, but a bloody fluid, which does not coagulate,—a circumstance which is always important in drawing the distinction between healthy menstruation and menstruation in excess. Whenever the fluid discharge presents blood, properly so called, that is, blood which undergoes coagulation, it is no longer the menstrual secretion, but it is blood which is exhaled or effused in consequence of a morbid state of the vessels of the womb, and very generally from a morbid state of the system at large.

With the deviation in the qualities of the discharge are conjoined deviations in frequency and in amount. Some females menstruate before the usual recurrence of the monthly period, that is, every three weeks, and others menstruate every two weeks, *i. e.* twice in the course of the lunar period. These deviations, however, may not amount to actual disease.

It is different when the discharge exceeds in amount; because then it is no longer the deliberate and mature secretion from the uterine vessels, but the result of hemorrhagic congestion. Though it is difficult to fix the exact amount which may

constitute genuine *metrorrhagia*, it may be said that any quantity of blood beyond six ounces or half a pound is hemorrhagic.

The fact will be more clearly established if the patient shivers and then becomes hot, with quick pulse, sense of weight and fulness, heat and pain in the loins and hypogastric region; if the external organs be hot and itching; and if the patient feels, after a considerable discharge of red coagulating blood, great weakness, languor, and oppression, or faints during the time or shortly after.

The pathological cause or causes of *menorrhagia* are not well known. By various authors, as Manning and Leake, the hemorrhage is ascribed to plethora, excessive irritability of the womb, or preternatural relaxation of the vessels of the organ. Similar to this is the idea of Cullen, who, regarding it as an active hemorrhage, ascribed it either to the hemorrhagic effort of the uterine vessels preternaturally increased,—or, supposing that effort to remain unchanged, to preternatural laxity of the extremities of the uterine arteries. These, however, are statements of the fact rather than explanations of the means by which it is accomplished. The discharge is observed to take place in two classes of females; the feeble and flaccid, and the plethoric and vigorous; and the hypothesis now mentioned appears to have been framed to reconcile the opposite characters of the different subjects of the disorder. In one circumstance, viz. excessive fulness of the vessels of the womb, both may agree; while they may differ in the state of the constitution by which this local fulness is produced. Local fulness, it may be added, always depends on local feebleness of vessels, as it indicates irregularity in the distribution of the blood. It is not difficult to understand, that this irregular distribution may take place in those presenting the external characters of feebleness and relaxation, as well as in those presenting the characters of general plethora. The blood which, in a more vigorous and robust frame, is distributed equally to the skin and external parts, is in these persons accumulated in various internal organs.

It is undoubtedly true, that many instances of excessive menstruation take place in subjects termed weak, lax, or relaxed; and not a few in those considered as plethoric; and in this sense, therefore, it may be said, that the uterine vessels are roused to an unusual effort in languid or plethoric subjects. Many phenomena, however, show that immoderate flow of the

menstrual secretion, or even of blood from the inner surface of the womb, depends on unnatural accumulation of blood in the uterine vessels, from which it is discharged, chiefly by exhalation, as in other hemorrhagies. The cause producing this accumulation is, like that of other hemorrhagic diseases, quite unknown.

Uterine hemorrhage, or excessive menstruation, may subside spontaneously, or under the use of remedial measures, without causing much diminution of strength. But when it is active and acute, or recurs often, it may induce other dangers, and is always indicative of a morbid state of the womb.

Copious hemorrhage, in short, or that which is often repeated in a female, young and otherwise healthy, is always indicative of an inflammatory state of the womb; and though sometimes the discharge of blood forms a sort of natural cure of this inflammatory condition, yet it may induce various other morbid states. In the *first* place, hemorrhage from the womb may recur often, and subsiding temporarily, it is followed by pain and weight in the hypogastric region, quick pulse, heat and thirst, and, in short, all the usual symptoms of metritis or inflammation of the womb, requiring copious and repeated depletion from the system. *Secondly*, the hemorrhagic congestion may, by repeated discharges, induce a leucophlegmatic debilitated state of the system, terminating in *anaemia* and dropsy. In this class of cases, in general, the countenance is pale, waxy, and slightly tumid, the lips pale, the pulse feeble, the skin cold and dry, the extremities cold and swelled; and the patient at length becomes dropsical. *Thirdly*, the constant or repeated congestion of the womb is further believed to lay the foundation of chronic inflammation, either of the organ itself or its cervix and orifice. The latter becomes red, hard, sore, and tumid; the surface becomes abraded and raw, and is divided into fissures; ulceration of a bad and insurable character takes place; and the orifice of the womb, which is hard, irregular, and tuberculated, is then said to be affected with scirrhus and cancer.

I know not whether this can, in strict pathological language, be denominated cancer; but it is a malignant form of ulceration, which evinces no disposition to heal.

The same state of the womb is represented to give rise to the soft or bleeding cancer (*fungus hæmatodes*; *encephaloma*.)

But I believe that all that it does is to act as an exciting cause. It is further probable that the hemorrhagies taking place in the stead of menstruation are induced by the irritation of the newly developed heterologous tissue taking place and deranging the circulation of the organ.

ETIOLOGY.—I have already mentioned the immediate causes of *menorrhagia*, viewed as a symptom of inflammation or hemorrhagic congestion. But it is necessary to advert to the circumstances which give rise to the vascular congestion. Some of these circumstances are imperfectly known; at least it is by no means always easy to recognize their operation. Thus it is said that mental emotions, as alarm or panic, or sudden surprise, various physical causes, as a fall or shock, excessive or forced exercise, dancing, walking, and riding, high temperature, the excessive use of vinous or spirituous liquors, or abuse in sexual intercourse, are all circumstances which have been observed to be followed by *menorrhagia*. But when we consider the number of females in whom these causes are not followed by the alleged effect, it is evident that it is requisite to admit the existence of a predisposition, an internal or constitutional cause. It is probable that all those causes which induce plethora, or excessive distension of the vascular system, exist beforehand; and that the particular direction is given by local agents, or those which act on the reproductive organs. In this manner emmenagogues taken to an extreme extent are believed to act. But it must be remembered that these medicines are given for amenorrhœa, and almost constantly after unusual or long-continued suppression of the uterine secretion, the evacuation is proportionally profuse.

It is easy to understand how females, married very young, and those who have had repeated abortions, should be attacked with *menorrhagia*. In females also of the lymphatic temperament, and flaccid habit, with fair or red hair, menstruation is in general more abundant, and continues longer than in those of more vigorous constitution, with dark or chestnut coloured hair.

In all females, the period at which the uterine secretion is about to cease is rather critical as to its influence on the amount of the discharge. At that time it may pass over one or two periods, and then return with extraordinary and alarming profuseness. This irregularity having continued for some time, either the discharges cease altogether with improvement of

the general health, or they increase in frequency and profuseness, and it is found on examination that the orifice of the womb is affected with swelling, tubercular irregularity, pain and tenderness, heat, and upon inspection by the operator, it is found to be fissured by ulceration.

I may here conclude this division of the subject by adding, that *menorrhagia* may take place more decidedly as a symptom, in consequence of the following disorders. Fever, cholera, polypus of the womb, fibrous tumour of the womb, cauliflower excrescence of the womb, fleshy tubercle of the womb, *encephaloma* of the womb, syphilitic ulceration, phagedæna, and carcinomatous ulceration.

THERAPEUTICS.—The treatment in simple phlogistic menorrhagia consists in blood-letting, general and local, *i. e.* from the loins by cupping, if the pulse be full and strong, and symptoms of fever are urgent, the use of efficient cathartics, cold applications over the hypogastric region and within the vagina, low diet, rest in the horizontal posture, and the removal of all mental excitement. Minute doses of ipecacuanha are very powerful in allaying the irritative action of the uterine vessels; and digitalis has also been strongly recommended. In some instances, after the bowels have been freely moved, it is useful to inject cold water into the rectum. Food and drink should be taken cool, if not cold. The use of the mineral acids is important after the urgency of the hemorrhage has subsided. To strengthen the system generally, cold bathing and cold washing of the loins is beneficial.

II. Hemorrhage from the womb in its impregnated state may take place either during the course of pregnancy, or during the process of parturition. After conception, it is well known that the menstrual discharge ceases, and in the natural order of affairs no blood issues from the womb so long as it contains the foetus. Every discharge of blood, therefore, which occurs during pregnancy, however small, may be called a hemorrhage, because at that time it is not natural; though the greater the discharge, the more strictly proper is the term. The same may be said of those discharges which happen between the birth of the child and the expulsion of the *placenta*; which are often profuse, and not unfrequently dangerous. But the discharges of blood or bloody fluid which take place after the expulsion of the *placenta*, are to be regarded as hemor-

rhagies only when they are excessive in their degree ; because some loss of blood at that time is natural, and perhaps necessary. It may be said, therefore, that all effusions of blood, which are inordinate in quantity, or irregular in the time of their appearance, are to be regarded as hemorrhagies ; and those which require consideration at present may be divided into four sorts.

1. Those which occur in early pregnancy or in abortions.
2. Those which occur in advanced pregnancy, near or at the full period of utero-gestation.
3. Those which happen between the birth of the child and the expulsion of the placenta.
4. Those which follow the expulsion of the placenta.

1. Ectrotic Uterine Hemorrhagies, or those inducing Abortion. Abortion ; Miscarriage.

Abortion has been defined in various modes by different authors. Manning and the early accoucheurs applied it in a general manner to any untimely birth or detachment of the dead ovum. But afterwards more particular limits were assigned to the occurrence. Thus Denman, who has been followed by Burns, limits the character of abortion to those cases in which a dead foetus is expelled before the termination of the sixth month of pregnancy ; after which period all expulsions are to be considered as labour, premature or regular.

Abortion, therefore, consists in the detachment of the ovum from the womb, and its subsequent expulsion ; and the term has been confined to detachment of the ovum taking place at any time previous to three months before the natural term.

The nature of the process of abortion is not very well understood. There is little doubt that it depends on some peculiar state of the womb ; but what that state is, it is not easy to say. At one time it was supposed to depend on slipperiness or lubricity of the womb, as if the *ovum*, before loosely attached, slipped out of the organ ; but Denman justly remarks, this idea will not bear examination, being supported neither by the reason of the thing, nor by the occurrences of practice. This author, in general perspicuous and rational, has several rather unintelligible notions on the subject, in which he confounds the pathological with the final cause of the accident. Nor is he more fortunate in his idea of the consent between the *foetus* and the shell of the ovum, as he terms the membranes and pla-

centa. "If the shell," says he, "becomes diseased, then the foetus, being deprived of its nourishment, is of course destroyed, and both are expelled as any other extraneous body would be, though not immediately on the accession of the mischief. There is reason to believe, that the part of the ovum most commonly diseased is not that which passes from the ovarium, but that production of the *uterus* which is prepared for the reception of the ovum after its passage from the ovarium, and which may be called the connecting membrane of the ovum."

The subsequent observations are more distinct and precise, and make a nearer approach to the explanation of the process of abortion. "When that process by which the two membranes are cemented goes on without interruption, I believe the connection is completed between the sixth and tenth week from the time of conception. But when an abortion is about to happen, there is usually between this and the outer membrane of the *ovum* an effusion of blood, which often insinuates itself through the cellular membrane of the placenta, and between the membranes, giving internally to the whole ovum a tumid and unequal appearance, not unlike a lump of coagulated blood, for which it has been frequently mistaken, and then it is popularly called a false conception." (Vol. ii. p. 280.)

The effusion of blood here mentioned by Denman shows what takes place in order to produce abortion. It is in truth the effect of that state of the uterine vessels, the placental vessels, or of both, which precedes abortion, and which, if not checked by art, or subsiding spontaneously, must terminate in this accident. The vessels of the placenta, naturally full of blood, may, from a variety of causes operating on the mother, become unusually distended, and give way as in other hemorrhagic injections. This rupture may take place either at the uterine surface of the placenta, or in its substance, or in both at once; and in either case a greater or less extent of the placenta is speedily detached from the womb; the usual supply of blood is interrupted; and the foetus perishes in consequence. It is in this sense only that the remark of Leake is to be understood. "Whatever may be the cause of abortion, the effect is produced by a separation of the after-burden from the womb, and consequently, the child, being deprived of nourishment, must soon perish and be expelled." (Vol. i. p. 149.) To this view of the nature of the abortive process it cannot be objected, that

the causes after which it has occurred are various, opposite, and different from that which are now assigned. These causes are the remote, which may be very different; this is the pathological, which is invariably the same.

The symptoms of abortion are those which threaten, and those which denote its occurrence. They are very various in different women, and in the same woman they may vary in different pregnancies. The ovum may be detached from its connections at an early period after impregnation, for instance, before it has descended into the womb, *i. e.* about three weeks after impregnation; and then the symptoms are much the same as those of menorrhagia. These are pain in the back and loins, various uneasy feelings, amounting to tormina, in the intestines, a sense of unusual heat and tenderness about the parts of generation, frequent micturition and tenesmus, the discharge of a watery fluid tinged with blood, or of reddish mucus, commonly called a *shew*. But the most certain sign of abortion, either approaching or already taken place, is a discharge of pure blood, which proves that some part of the ovum is already loosened from the womb. At the same time the pulse is quicker and fuller than natural; the skin is somewhat hot, or the patient feels irregular chills; and she may faint entirely.

It is no doubt true that a discharge of pure blood may take place once, twice, or oftener, according to some, without preventing the woman from going on to her full time; but in general it is a sign so certain, that it would be unsafe to act in any other way, than as if abortion was actually apprehended.

When abortion threatens or takes place at a later period, that is, after the ovum has descended into the womb, the presence of the dead ovum gives rise to symptoms a little different and more intense. The womb evinces a tendency to contract, and the patient complains of uterine and down-bearing pains; and the disorder of the stomach and intestinal pains are more severe. The discharge is abundant, and contains shreds of fibrous matter, the remains of that which had formed the connection between the ovum and the womb.* In general,

* “ In cases of apparent miscarriage there is one particular sign which ought to be attentively regarded, *viz.* the discharge of a flesh-coloured flaky substance which comes away with the waters. When this delicate membrane falls off from the womb, and thus appears, it is out of the power of human art to prevent the impending evil; this substance, being the very cement or *bond of union* between the mother and child, and being now broken down and dissolved, all communica-

blood is discharged to a greater or less amount, and may either form a clot round the ovum, which is expelled some time afterwards, or may continue to flow afterwards, forming clots in the vagina.

When abortion takes place at a later period, for instance during the course of the third month, or at any subsequent period, the sympathetic disorder of the system in general, and of the alimentary canal in particular, is usually more conspicuous. After aching, weariness, and pain in the loins, sometimes with pain in the hypogastric region, the patient, who is sometimes sensible of something having given way internally, feels sick and faint, or as if a sudden qualm had come over her. In some instances she falls down entirely; and when she recovers her consciousness she feels fluid trickling down the vagina. This is either the amniotic fluid, or blood, or the two conjoined. Pains in the belly are felt; sickness continues, sometimes followed by vomiting. Pains in the womb then follow; blood continues to be discharged, either in considerable quantity or more sparingly until faintness recurs; and then the discharge of blood ceases, and shows almost no tendency to return. Meanwhile, uterine pain, indicating contractions, returns at intervals; and in the course of an hour or two, sometimes more, a clot of some size is discharged, or is found in the vagina by the accoucheur or nurse; and this clot contains the ovum.

The quantity of blood discharged varies in different individuals, either in consequence of the different sizes of the *ovum*, or the points to which the placenta is attached. Sometimes not more than five or six ounces are lost; sometimes one or two pounds; and sometimes blood continues to ooze away for a day or two. At first it is always mixed with amniotic fluid.

The symptoms which show that abortion has already taken place are, after these already enumerated, flooding, or discharge of bloody fluid to greater or less extent, unconsciousness of the motion of the infant, showing that it is dead, sense of dull weight in the lower part of the belly, flaccidity of the breasts, evacuation of the waters, generally in a putrid state, and at length the discharge, after a period variable in duration, of a dead foetus.

In all these cases the process is followed by oozing of a tion must cease; and the last being deprived of nourishment, abortion will follow.
—Leake, Vol. i. p. 152.

blood-coloured but watery fluid, or the discharge of clots for several days, according as the patient is kept quiet and cool, or attempts to rise, or takes stimulating articles of food. Denman represents the chief immediate danger to be hemorrhage, because it may occasion local diseases, or forms the commencement of various dangerous diseases of the womb or its appendages.

The remote causes are imperfectly known; and it is so much more difficult to ascertain them with any degree of precision, that the same cause is not invariably followed by abortion; and that a circumstance which would produce no effect on one woman will be succeeded by abortion in another. In general, however, the following circumstances may be mentioned as often followed by abortion.

In the *first* place, plethora of the vascular system, or whatever causes it, as full living, the use of wine or other fermented liquors, habitually or to excess, must be allowed to be a most powerful predisposing cause of abortion.

In the *second* place, various morbid states of the womb, especially its interior surface, various morbid states of the ovaries, and various morbid states of the vagina, are calculated to give the disposition to abortion. Among the morbid states of the womb must be reckoned inflammation of its inner surface, however induced, but especially that form of chronic inflammation in which membranous shreds are formed. It is true that, in this state of the womb, impregnation rarely takes place; but it is answered, if it do take place, then it is very likely to be followed by abortion in the course of a few weeks afterwards. The same may be said of those morbid states of the vagina or the orifice of the *uterus* and the vagina, which give rise to utero-vaginal catarrh, or what is commonly called whites, (*fluor albus; leucorrhœa.*) The same may be said of gonorrhœa, or syphilitic ulcers in the vagina. Besides the conditions now specified, it is observed that morbid conditions of the placenta, as placental inflammation (*deuteritis*), or any of its effects, as morbid adhesion, induration, softening, or suppuration, are liable to be followed by abortion. I admit that it is possible that the placenta may be diseased independently; but I think all that is known of this subject shows that its diseases are the effects of previous disease of the womb.

In the *third* place, various agents used as medicines have the effect of inducing the predisposition to abortion, and even

abortion itself. One of the most remarkable in this respect is mercury, the use of which to affect the constitution is very generally followed, not only by a disposition to abortion, but by the abortive process itself. When mercury is given to a pregnant female so as to produce ptyalism, it very rarely fails that abortion takes place, especially if the mineral be administered in the early period of gestation. But even in the later periods, I have seen it repeatedly followed by abortion, and in general with death of the infant. The mode in which this substance operates is unknown. It is only understood that it induces a febrile and inflammatory state of the system. Another substance which exercises remarkable influence in the same manner is spurred rye, which possesses a singular power in exciting the uterus to contract, and probably in that manner disposes to hemorrhage and detachment of the placenta.

The two agents last mentioned may act in inducing both the disposition to abortion and also the act of abortion itself. Other agents require yet to be mentioned, which act chiefly in the manner of exciting causes of the process of abortion.

The first order deserving mention consists of various morbid states of the system, induced by the presence of particular diseases. Of this kind are continued fever, (*Synochus and Typhus*,) cholera, yellow fever, plague, scarlet fever, various inflammatory disorders, small-pox, and almost all those disorders which prevail at certain periods as epidemic. It is matter of common observation, that pregnant females attacked by fever are very liable to miscarry. During the prevalence of cholera in this country very few or no pregnant females escaped abortion.

Blood-letting was represented by Hippocrates, (Aphor. Lib. v. 31,) to be productive of abortion; but I believe not with good reason, though the dogma has been repeated by many modern physiologists. This I know, that it is common for unmarried females who have become impregnated, to have recourse to this as a means of procuring abortion; and very generally they have given birth to living infants. I have also repeatedly had occasion to take large blood-lettings from pregnant females for the cure of inflammatory symptoms; and never yet saw these evacuations followed by abortion. It is indeed one of the best methods of preventing abortion, and causing a woman to go to the full time.

Sneezing, coughing, and vomiting have been accused of pro-

ducing abortion. It is rare, however, that these actions do so. When vomiting is followed by abortion, it is chiefly when it is produced by acrid irritants, which irritate the whole alimentary canal.

The active cathartics seem occasionally to induce abortion. It is only, however, when they possess very irritating properties; and in general cathartic remedies are taken by unmarried females with the view of causing abortion, with as little effect in that way as blood is drawn from the system. Numerous cases of their harmlessness in this respect are given by Zachias and other writers on legal medicine. They should, however, be administered with gentleness and caution where the tendency to abortion is manifest. Aloes are believed to be hurtful.

Various diuretic and emmenagogue remedies also are believed to be injurious. Of this kind are the resinous substances and essential oils obtained from the Terebinthinaceæ, as oil of turpentine, oil of juniper, oil of savine, and other essential oils. It does not, however, always happen, that even the use of these acrid substances is often followed by abortion. A woman took every morning for 20 days, 100 drops of the essential oil of juniper, without undergoing abortion, and gave birth to a boy at the full time. In 1790, a half-imbecile and cachectic girl, at Aosta, who had become pregnant, swallowed at the seventh month a large spoonful of wine containing a strong dose of savine. She suffered, indeed, acutely from burning heat in the bowels, vomiting and hiccup, and had fever, extending beyond 15 days. Yet these symptoms subsided, and two months after the girl gave birth to a healthy infant, and herself recovered completely. To this case it may be objected that the chance of inducing abortion is diminished at the seventh month.

Many agents reputed emmenagogue have evidently no influence in producing abortion, such, for instance, as saffron, borax, *Artemisia* or mugwort, *Matricaria*, chamomile and similar substances.

The influence of various mechanical agents is more manifest and less equivocal. Thus falls in which the belly receives a concussion, blows or contusions of the belly, and similar injuries, are occasionally followed by abortion. To the same head must be referred the introduction into the womb of those mechanical contrivances which have been commonly employed to

procure abortion, as well as to induce abortion, in order to supersede the necessity of the Cæsarean section.

In the same manner, dancing, leaping, or running, are occasionally followed by hemorrhage with abortion. In all these cases there is both a general disorder of the uterine vessels, and perhaps an unusual accumulation in the vessels, favourable to hemorrhage, and consequently to abortion.

Moral causes are often observed to exercise considerable influence in exciting abortion. Thus the gay or the gloomy passions are sometimes equally hurtful to the pregnant female. But, above all, surprise, alarm, terror or panic, are extremely dangerous in the effect which they exert upon the womb and its circulation.

Regarding most of these exciting causes, excepting the class last mentioned, it is necessary to say, that not one of them produces abortion, unless by so serious an injury to the womb of the female, and consequently to her general system, as not unfrequently either to produce immediate death, or to lay the foundation of a long train of bad health. Most of them must act, if they act at all, by irritating the muscular fibres and the vascular system of the womb; but in most cases in which this irritation takes place in a degree and extent sufficient to detach the ovum, it is liable to induce so much disorder in the womb as to prove fatal; and if not, it renders the individual very generally incapable of subsequent impregnation. Puriform or bloody discharge takes place from time to time; shreds of coagulable matter also are expelled; procidentia even, or inversion may take place, and at length the sequelæ, mentioned under the head of Profuse Menstruation, usually ensue.

Even in those cases in which impregnation does ensue, when one abortion has occurred, another is liable to ensue afterwards; so that the health of the patient is impaired by successive attacks of uterine hemorrhage; and the womb itself is becoming progressively more and more diseased. Its inner membrane and its body are affected with chronic inflammation; the organ becomes thick, indurated, and heavy, or hypertrophied; various morbid discharges take place from the interior and its neck; and at length the patient falls into a state of atrophy and anæmia, or becomes dropsical, or falls a victim to tubercular induration of the orifice of the womb.

From all the facts now stated, it may be inferred, that ectrotic uterine hemorrhage, or that inducing abortion, takes

place under two different states;—the first, either a morbid plethoric hemorrhagic state of the womb and its vessels; the second, forcible detachment of the ovum from the inner surface of the womb, causing laceration and hemorrhage.

THERAPEUTICS.—The treatment of ectrotic uterine hemorrhage will depend much on the cause or causes by which it has been produced. It may be distinguished into the treatment of threatening, and the treatment of actual ectrotic hemorrhage. Wheneyer it can from the symptoms be inferred that abortion is about to take place, the first measure is, by means of blood-letting and low diet, rest and tranquillity of mind, to remove the symptoms of plethora and uterine irritation. Though blood-letting has been charged with being a cause of abortion, yet we possess not a more powerful means of preventing the accident, and removing the state on which it depends. The amount to which it is required to be carried will depend both upon the symptoms of particular cases, and the effects produced. In general, it is desirable to take from vigorous plethoric females from twenty-five to thirty ounces of blood; and it is sometimes requisite to have recourse to a second, or even a third venesection, varying from eighteen to twenty ounces.

With blood-letting, it is essential to combine low, and, in some instances, very spare diet. This is particularly requisite not only in corpulent females of sanguine temperament, but even in those who look thin and emaciated. In the latter, it often happens that the external appearances of delicacy of constitution are associated with a great disposition to congestion in different internal organs; and the most effectual mode of counteracting this congestion is the adherence for some time to low diet.

The bowels should be emptied by gentle laxatives or enemata, to prevent uterine irritation.

After blood-letting has been performed, and the bowels have been emptied, sometimes opiates are of great use in suspending the progress of the symptoms of uterine hemorrhage. In other cases digitalis or ipecacuanha are the remedies from which most benefit may be anticipated. Given in minute doses they allay the irritation of the vascular system, and obviate the tendency to local congestion, and consequently that in the uterine vessels.

When the symptoms indicate that abortion has already taken

place, and that discharge of blood is proceeding so as to appear either in clots or the fluid form, the first and most important object is rest and quiet, and the application of cold to the loins, the hypogastric region, and the external parts. It sometimes happens that the bleeding is so copious and so sudden, that it seems impossible to have recourse to blood-letting; and if the patient faints, it is unnecessary. The effect required is then produced, and the patient is placed in the condition most favourable for the cessation of the hemorrhage. If this, however, do not ensue, it is safer to detract a small quantity of blood from the arm than to allow it to flow from the womb, where the practitioner has not the same means of suppressing it. In those cases, also, in which faintness comes on, it often happens that it is temporary only; and when it ceases, and the patient recovers consciousness, a state of febrile disorder with heat ensues. In this case, it is equally requisite to have recourse to blood-letting and the antiphlogistic regimen, as in the first, not only to arrest the hemorrhage, but to obviate its effects, as inflammation of the womb, acute or chronic.

Lastly, there is a form of ectrotic hemorrhage, which might be called imperfect or latent; because very little blood appears at the time, but may be discharged afterwards, or because it produces a partial detachment of the placenta, which is afterwards united to the uterus by adhesive inflammation. In this class of cases adhesion will be preternatural, and cause much inconvenience and difficulty in delivery. But the best mode of obviating the violence of this inflammation, and preventing much preternatural adhesion, which is always in proportion to the intensity and the duration of the inflammation, is to employ blood-letting to sufficient extent to put a stop to all the symptoms.

In all cases, as great tranquillity of mind as is practicable is advantageous.

In general, under the use of these measures, ectrotic hemorrhage of the womb subsides; and the patient proceeds to the full time without further accident.

But it sometimes happens that a series of hemorrhagic ectrotic attacks take place in the same female much about the same period of gestation. As these attacks were often ascribed to some disorder either of the constitution or the womb, which was conceived capable of being removed by the use of

mercury, it was not unusually proposed to subject females liable to abortion to a course of mercury ; and in some instances it was observed that the abortive attacks no longer returned.

It is now known that this is not requisite ; and it is so much less advisable, that abortion has been known frequently to take place in the persons of women whose systems were charged with the mineral. Mercury, in short, should be exhibited in no case of ectrotic uterine hemorrhage ; for while it is exceedingly doubtful whether it will be beneficial, it is almost certain that it does mischief. It is, nevertheless, occasionally given at present, where it is suspected that the ectrotic action of the womb depends on the presence of latent syphilis. In such circumstances, perhaps, a more judicious mode would be found in general and local treatment, with occasional small blood-lettings, and the subsequent use of iodine.

When the occurrence of abortion appears to depend on an irregular state of health, with unequal distribution of blood, nothing is found to be more useful than travelling ; not taking a hasty journey, but wandering about in easy stages, for many months. The gentle occupation of the mind and body, resulting from this incessant change of scene, has a remarkable influence in removing that morbid sensibility which results from the habitual indulgence in the luxurious habits and refinements of civilized life. The mind becomes soothed and composed, the body becomes less nervous and irritable, and the circulation, both general and local, comes much nearer than formerly to its natural state.

It is sometimes important, with the view of preventing what may be denominated the ectrotic diathesis, to endeavour to improve the general health, and remove, if possible, all symptoms of disease in the womb and its appendages. With this view, cold bathing has been strongly recommended ; and the use of the chalybeate mineral waters has had numerous advocates. Cold bathing is certainly a powerful agent, and, if properly managed and combined with suitable diet, it is a useful remedy. But it is liable to be abused, and has often been followed by injurious effects. It should be taken only three times in the week at first ; and in cases in which, from symptoms of internal congestion, its propriety may seem questionable, the best plan is to begin with the tepid salt water bath. When this produces no bad effects, it should be employed cold ; and then,

perhaps, all the benefit may be obtained from its use three or four times in the week.

The chalybeate mineral waters have been also strongly recommended by several practitioners. They are, nevertheless, not safe remedies, because they are liable to increase the phlogistic diathesis too much.

2. Uterine Hemorrhage. Uterine Hemorrhagies occurring during the latter three months of Pregnancy. Flooding. *Menorrhagia Gravidarum. Metrorrhagia Graviditatis.*

THIS accident may occur in the latter stage of utero-gestation in the same manner in which it takes place during the first six months. But two peculiar circumstances have been mentioned, under which it is particularly known to take place. The first of these consists in detachment of more or less of the placenta from the womb; the second is occasioned by attachment of the placenta over the *os uteri*, or very near its neck, and its consequent detachment either as pregnancy advances or parturition approaches.

a. In the former case, the detachment is much of the same nature as that which gives rise to abortion. The accident is dangerous in proportion to the extent and suddenness with which it takes place. It may be occasioned by great violence or mechanical injuries in the latter part of pregnancy; or in some intense fit of fainting, convulsion, or laughter; and sometimes the whole, or a very large part of the placenta, may be detached suddenly, without any accident or symptom, which could indicate that such an event was to be apprehended. It is not improbable that such detachments are the result of the same or a similar state of the uterine vessels, which I have said terminates in abortion.

This hemorrhage is to be recognized by the sudden discharge of blood, by the fainting of the woman, with the sensation of something having given way in the region of the womb, and by ascertaining that the placenta is not attached over the *os uteri*.

The treatment consists in blood-letting, rest, cool air, and low diet, until the discharge has subsided. If, under this management, hemorrhage be not speedily checked, cold water, or ice should be applied to the loins, thighs, and vagina.

b. Though the placenta is usually attached somewhere about the fundus, generally the upper and posterior part, of the womb,

yet it may also be attached in certain cases lower down, near the neck, or over the orifice of the organ. This circumstance, or rather the fact, that, in certain circumstances, the placenta presents itself at the orifice of the womb in parturition, was known to Mauriceau,* Paul Portal,† Peu, Petit, and other early obstetrical writers; and all of them were aware of its influence in causing profuse, dangerous, and even fatal hemorrhage; and laid down rules for preventing the accident. Some seemed to imagine that, in such cases, the placenta had been attached at the fundus, but had fallen down towards the cervix; but Portal first, and afterwards Petit, showed in 1723, by dissection, that it was attached in such cases near the cervix or over the orifice; Giffard, in this country, taught the same doctrine; and about the middle of last century Levret laid down exact rules for the guidance of the accoucheur in such cases. At a period still later (1784), Dr Rigby of Norwich called the attention of the profession to it as a cause of what he termed unavoidable hemorrhage.

The placenta may be attached to the cervix or *os uteri*, without being attended, during the early stage of pregnancy, with any bad symptoms. But towards its latter part, that is, during the seventh and eighth months, when the *cervix* begins to be distended or developed, and especially as labour is coming on, this distension is almost invariably attended with a necessary separation of part of the placenta, and hemorrhage to a greater or less extent takes place. It is manifest that the changes which the *cervix* and mouth of the womb undergo previous to labour must increase this separation; and hemorrhage will recur from time to time, until, by its repetition and extent, it becomes alarming and truly dangerous. It has accordingly been found that, in most cases of profuse and alarming, or fatal hemorrhage from the womb at this period, the placenta is attached near the *cervix*, or over the *os uteri*, and that more or less of it has been forcibly detached during the distension of the neck and opening of the mouth of the womb. The hemorrhage is generally, but not always, in proportion to the space of the placenta attached over the *os uteri*, or to the quantity separated; it is more uniformly profuse and almost irrepressible, according as

* Les Maladies des Femmes Grosses et Accouchées. Paris, 1673. Chapitre xxviii. p. 337.

† La Pratique des Accouchemens, par Portal. Paris, 1685.

the part detached is near, or distant from, the insertion of the navel-string, where the blood-vessels are large and fully distended with blood.

It is not always easy to ascertain whether, in any given instance of uterine hemorrhage, the placenta is or is not attached over the *os uteri*. Denman states that, before there is some degree of dilatation of the orifice of the womb, however profuse the discharge may be, it is not always possible to tell with certainty, whether the placenta present or not. It may, indeed be conjectured that the placenta is there attached by the cushion-like feel of the cervix and lower parts of the womb; but where the *os uteri* is somewhat dilated, instead of the membranes, the fleshy substance of the placenta may be readily distinguished. In the early stage of labour, on the other hand, the placenta may be attached over the *os uteri* in such a manner as to cause profuse hemorrhage, when the orifice is not sufficiently dilated to ascertain its presence; or a firm *coagulum* of blood effused into the membranes may so closely imitate the placenta as to be with difficulty distinguished from it; or so small a portion of the placenta may be attached over the *os uteri*, that, unless the finger could be passed completely round the circle, which is rarely possible, it could not be discovered; or lastly, the placenta may be attached, not over the *os uteri*, but to the neck only, in such a situation as to cause profuse hemorrhage during the dilatation of the womb, yet so as to be completely beyond the reach of manual examination. Of all these difficulties it behoves the practitioner to be aware; and to exercise the greatest judgment, coolness, and promptitude, either to understand or to obviate them.

The treatment, which consists in early and prompt delivery, belongs to the subject of midwifery.

3. Of uterine hemorrhagies, which come on immediately or soon after the birth of the child, the consideration belongs also to the subject of midwifery.

4. Uterine hemorrhagies which follow the expulsion of the placenta.

The moment the foetus is expelled from the uterus and begins to breathe, the current of blood takes a new direction; and the whole of that which was circulating between the pla-

centa and foetus is either retained in the substance of the former, or circulating in the body of the latter. The uterine blood takes also a new direction, being impelled chiefly into the *mammæ*. But the chief circumstance is, that, by reason of the contraction of the uterine *parietes*, and the general diminution of the organ, whether that is to be ascribed to some peculiar action of its vessels, or to the fibrous matter constricting its vessels, the numerous large vessels of the uterus are necessarily diminished in number and size, and cease to convey blood to those which communicate with the placenta. The foetal blood at the same time being no longer returned, the vessels of the latter organ are in ordinary circumstances emptied and shrink; and from these changes in the utero-placental circulation chiefly, the *placenta* drops as a matter of necessity, from the surface of the womb, shortly after the *uterus* has expelled the foetus.

The uterine contraction, however, with the altered current of blood, though sufficient in ordinary circumstances to prevent profuse or enfeebling hemorrhage, is not sufficient to prevent a moderate oozing from the vessels; and, indeed, as the womb shrinks very gradually, the oozing continues for several days. The oozing thus taking place is known by the name of the *Lochial discharge*;—(*lochia*.) This consists of the blood which either flows from, or is pressed out of, the extremities of the blood-vessels which had supplied the cellular part of the placenta with blood, and which, on its coming away, open into the cavity of the womb.

Its source, therefore, is chiefly in the veins or venous sinuses of the womb; and the discharge, in a moderate or natural degree, is believed to be requisite to the safe contraction of the womb, and the uninterrupted convalescence of the patient. It has been supposed that the womb, by the immediate evacuation of the large vessels, is allowed to contract itself more freely without danger of inflammation, which might happen if the contraction of the large vessels were not emptied at the same time. As the blood in the small vessels, however, and the uterine extremities of the vessels generally, cannot be immediately emptied or returned into the veins, a slow and gradual evacuation continues, until the womb contracts to the same size which it had before pregnancy. This may be effected about the 14th, 18th, or 20th day after parturition, though

the period varies in different females. "The lochia," says Rush, "are nothing but a slow spontaneous bleeding, performed by nature, and intended to obviate inflammation of the uterus after parturition."—*Inquiries and Observations*, Vol. iv. p. 350.

Much pains have been taken to ascertain the average quantity of the lochial discharge, with a view to regulate it, especially as its abundance or scantiness has been respectively believed to give rise to various diseases. But when the nature of the evacuation is considered, the difference of the quantity will be found to vary much, and not to be reducible to any general rule.

The quantity of the lochial discharge will vary according to the management of the placenta. In some it is very small; in others, every act of parturition is followed by profuse hemorrhage, which may suddenly reduce the patient to an alarming state of weakness.

These variations depend more or less on the mode in which the placenta is managed, and on the celerity with which the womb contracts. When the womb contracts more rapidly and effectually, the discharge of blood is trifling: when it contracts slowly and imperfectly, it is more copious. At first it is common pure blood; but as the womb contracts and the vessels become smaller, it assumes successively the appearance of bloody water, greenish serum, and lastly, watery fluid, till, the vessels becoming impervious, it ceases entirely.

The red colour of the lochia usually continues till the fifth day, though the tint is less deep, and the consistence more watery every day from the end of the first twenty-four hours. About the fifth day it begins to be clearer, and has a greenish tint; a circumstance which indicates the contraction of the vessels and the formation of clots at their orifices. The greenish colour is supposed to be imparted by the solution of the remains of the decidua; but it is quite as likely that it is derived from the remains of the colouring matter of the blood.

Though the lochia may continue, as already stated, to the eighteenth or twentieth day, yet the amount diminishes daily, and most speedily in females who suckle their infants, and who have lost a good deal of blood at first. The colour, quantity, and duration of the discharge, nevertheless, varies in different women. In some women the red colour disappears on the first or second day, in others it continues to the end of the

month. The evacuation in some is small ; in others excessive ; in one woman it may cease soon ; in another it may flow during the whole month ; yet all of these patients may do well.

The lochial discharge in moderate quantity is believed to be not only safe, but beneficial in warding off the approach of various distempers incident to the puerperal state. Its sudden suppression or disappearance, accordingly, is regarded as unfavourable ; and indeed in all cases of inflammatory attacks, either of the womb or its appendages, the discharge is either suspended or greatly diminished, and even in inflammatory or febrile disorders affecting the system and the other internal organs, its amount is diminished or it disappears. It has been a subject of some dispute whether it disappears in puerperal fever ; and its absence or presence has been then supposed to be important as a diagnostic sign. In most cases of puerperal fever, in which the uterine mucous surface and substance is affected, it ceases to flow, or becomes very scanty ; and in general it disappears in severe and violent attacks of the disorder. When any degree of it remains, it shows a mild and manageable form of the disease ; and in those cases in which it returns after being suppressed, the prognosis is favourable. I have met, nevertheless, with cases of severe utero-peritoneal inflammation, in which the discharge was said to continue. In cases of this kind, however, it is to be suspected that a mere sero-sanguine discharge from the parts was mistaken for the true lochial discharge.

Redundancy of the lochial discharge is rarely a primary affection, but depends either on unusual fulness of vessels and too great strength of the capillary circulation, or on a great degree of weakness. In the former, the force of the action of the heart, and the fulness and tension of the blood-vessels, should be lessened by blood-letting ; and in the latter, bark, bitters, the sulphuric acid, with due attention to the state of the bowels, and the employment of efficient cathartics, constitute the most suitable remedies.

CHAPTER II.

HEMORRHAGIES OF THE SEROUS MEMBRANES.

DISCHARGES of blood from the serous membranes have not attracted the attention of physicians so much as those which take place from the mucous membranes. It is, nevertheless, certain that they are not uncommon, and though the concealed and inaccessible situation of these membranes has either made them be overlooked or confounded with other diseases, they constitute a form of morbid derangement too important to be altogether omitted. They occur in all the serous membranes, are preceded by congestion, take place by exudation, and may be arranged in the following order.

§. I. *Meningæmia*. If we regard the arachnoid as a serous membrane, which uniformity, perhaps, requires in this place, we find that it is not an uncommon seat of bloody effusion, and that discharges of blood found on the surface, or in the ventricles of the brain, as recorded by authors, may be in many cases traced to this membrane.

The course and arrangement of the arachnoid membrane were shortly explained in speaking of water in the brain. From what was there stated, it must be understood, that the arachnoid membrane not only covers the *pia mater*, and the convoluted surface of the brain, but lines the *dura mater*, and penetrates along with the choroid plexus into the figurate surface, or that which forms the ventricles. It will not, therefore, be difficult to see that hemorrhage of the arachnoid membrane may take place either from its free surface, or the circumference of the brain, when the blood will be found between the *dura mater* and the *pia mater*, or from its free surface in the choroid plexus, when the blood will be found in the ventricles;—and either of these cases form a great proportion of those in which authors have actually recorded instances of bloody effusion in the head—causing the symptoms denominated apoplexy. A good example is given in the 47th case of Rochoux, p. 186.

There is another case in which blood has been found effused on the convoluted surface of the brain, in which there is reason to believe the source was the vessels of the *pia mater*; but of this no further notice need at present be taken than as

it seems to be connected with the attached surface of the arachnoid membrane. (Howship, case 14.) This disease is the meningeal apoplexy of M. Serres.

In like manner, blood may be effused from the modification of the arachnoid membrane, which envelopes the spinal chord, and may there give rise to symptoms somewhat similar in kind, though slighter in degree, than those arising from blood effused within the head. The best examples of this variety of arachnoid hemorrhage are those described by Mr Chevalier in the third volume of the Transactions of the Medico-Chirurgical Society, and that described by Sir Astley Cooper, in his work on Dislocations and Fractures. (See also Veratti, in the Bologna Transactions, p. 185, and Morgagni, 3d epist. Art. 2.)

The circumstances which determine hemorrhage from the arachnoid membrane, further than external violence, are not well known. In some instances, it appears, like other cerebral hemorrhagies, to depend on an unsound state of the arterial system, either in general or of that of the brain. But too little is known to warrant any positive conclusions.

§. II. Hemorrhage from the Pleura, (PLEURÆMIA,) though perhaps less common than that from the arachnoid membrane, is, however, not entirely unknown. Morgagni and Lieutaud record several cases in which much blood, either fluid or coagulated, was found in the cavity of the chest after death,—which could not be ascribed to any wound or contusion, and which must have proceeded from exhalation from the free surface of the pleura. This morbid effusion, which was improperly enough termed *sanguineous or bloody empyema*, has attracted the attention, of Laennec, who gives a particular account of it under the name *Hæmathorax*, (p. 198, Tr.) Blood issuing in this manner from the pleura may, in small quantity, be absorbed; but if it is not, it undergoes coagulation, the serum is decomposed, and air may be found in the cavity of the chest. It is on this account that hæmathorax rarely takes place without some degree of emphysema or pneumathorax. The symptoms are liable to variation. At first, there is generally a sort of tearing pain, with a sense of faintness, afterwards more or less difficulty in breathing, sometimes amounting to threatening suffocation, afterwards quick pulse, restlessness, and *orthopnœa*; the breathing becomes laborious and interrupted; and the patient dies partly of suffocation, partly of exhaustion. If the chest be examined by percussion and the

stethoscope, it may emit, *first*, the dull sound indicating the presence of fluid over more or less of the chest; *secondly*, the absence of the respiratory murmur, with more or less egophonia; *thirdly*, the resonance indicating the presence of air in a greater or less extent of the chest. It is, therefore, requisite to draw an accurate distinction between this disease and chronic pleurisy or empyema on the one hand, and emphysema and pneumothorax on the other.

§. III. Hemorrhage from the Pericardium, (PERICARDIÆMIA,) *Hæmicardia*, has been equally overlooked with the hemorrhagies of the serous membranes. In the few instances of it which have been recorded, it has generally been regarded as the effect of laceration or rupture of the auricles, venous sinuses, or origins of the great vessels, allowing the whole blood contained in them to escape into the pericardium, and distend this membrane like a bag containing a mass of coagulated blood. It has almost invariably been observed, however, that the most minute and diligent search was quite inadequate to discover either rupture, laceration, minute holes, or other orifices by which such blood was supposed to escape; and it can scarcely be doubted that the true source of the bloody discharge is the free or serous surface of the pericardium itself, which thus exhales, as it were, blood more or less pure.

This difficulty has not escaped the observation of Baillie, who attempts the following solution, by suggesting two conjectures. "The one is, that the vessels upon the surface of the heart may have lost a part of the compactness of their texture, so that the blood may have escaped through their coats by transudation. The other is, that blood may have been thrown out by the extremities of the small vessels opening upon the surface of that portion of the pericardium, which forms the immediate covering of the heart from their orifices, having been to a very uncommon degree relaxed.*

It is perhaps almost superfluous to remark, that the first opinion supposes an event which we know cannot take place in the living body; and that the second conjecture is merely expressing the fact of hemorrhage by exhalation from the free

* See Medical Observations, Vol. iv. p. 330. Memoirs of Medical Society, Vol. i. p. 238. To these I add a third case, given by Mr Wright, in the sixth volume of the Medical Observations and Inquiries, p. 1, and a fourth from Merat, Memoires de la Societé Med. d'Emulation, Tom. vii. p. 63.

or serous surface of the pericardium,—the opinion which the analogy of the serous membranes shows to be well founded.

As the instances of this disease have been generally confounded with mortal hemorrhage from rupture of a blood-vessel, so the symptoms have neither been observed nor recorded with the accuracy requisite to form a good history of them. In the instances best authenticated, the first symptoms have generally been a sense of sinking weight, and oppression at the epigastric region and in the site of the heart; paleness of the countenance, and in some instances fainting; smallness and irregularity of the pulse; and slight sensations of coldness of the surface and extremities. Afterwards the action of the heart becomes languid and indistinct as well as irregular; the patient complains of faintness and a most distressing anxiety, as if he were conscious of the speedy approach of death, and after no long time, the pulse becoming weaker and weaker, the respiration being languid and interrupted, and the surface and extremities being moistened with a cold damp sweat, dissolution takes place.

§. IV. Of Hemorrhage from various parts of the Peritonæum (*Peritonæmia*,) and of blood found fluid or coagulated in the abdominal cavity, several instances are recorded by authors on morbid anatomy. One good instance is that which Morgagni gives in his thirty-fifth epistle, of Lælius Lælii, a medical student, a native of his own town of Imola; in which about a pound and a-half of fluid blood was found extravasated in the abdominal cavity, and in which the peritonæum was marked in several places with black spots, undoubtedly the effect of the hemorrhagic action in the membrane, (Epistol. xxxv. 2.) This effusion, which was very rapid in progress, had been preceded by a sudden attack of pain in the umbilical region, not uniformly violent in the same place, and vomiting of porraceous or green-coloured bile, which eventually became black. As the disease proceeded, the countenance became anxious and peevish, the belly tense and painful on pressure, the pulse weak and wiry or constricted, and the urine red and inclining to brown, and very turbid. The fatal termination took place in little more than twenty-four hours. Several excellent examples of the same hemorrhage are recorded by Merat. (*Mém. Société Med. d'Emulation*.)

The symptoms of this disease, so far as they are capable of being understood, may be conjectured from this statement;

but not much of them is known with accuracy; and it is by no means easy to distinguish the hemorrhage of the peritonæum from inflammation and some other diseases. Hemorrhage may take place from particular regions of the peritonæum, as from the ovaries and Fallopian tubes in the female, and from the peritoneal coat of the liver, spleen, and bladder in both sexes.

§. V. As a membrane which at one period of life formed part of the peritonæum, I must notice also the vaginal coat of the testicle, which, either from inflammation or excessive vascularity, may pour forth pure blood. This may either be absorbed or may be organized. In the latter case, it not unfrequently lays the foundation of those tumours or growths which are found to affect the testicle or its coats.

§. VI. Lastly, blood may be effused from the synovial membranes of joints, or from those of the tendinous sheaths, when it may undergo the same changes, and give rise to the same effects which I have already noticed in speaking of the hemorrhage of the vaginal coat.

For more complete details on the hemorrhagies now mentioned, I must refer to the *Elements of Morbid Anatomy*, Chapter xxiii. Section ii.

The treatment of these hemorrhagic diseases may be comprised in a few words. Whenever the symptoms clearly indicate an effusion of blood going on, either from the arachnoid membrane within the head or within the spine, or from the pleura, or from the pericardium, or from the peritonæum, full bleeding from the arm, local bleeding by leeches, to the alleviation of the pain or other prominent symptoms, and every part of the antiphlogistic regimen, must be promptly and energetically practised. Evacuation of the bowels ought never to be omitted; but it will be particularly beneficial in hemorrhage from the arachnoid membrane and from the peritonæum. In those of the pleura and pericardium, it is not easy to say what other remedies may be useful. Analogy would point out foxglove, opium, and tartrate of antimony. But foxglove, there is reason to fear, might either be useless or actually hurtful; and perhaps the safest medicine is opium, either alone, or conjoined with a small quantity of tartrate of antimony. The sickness thus induced may be favourable to the cessation of the hemorrhage. The diet should be low; and coolness, quietness, and a good apartment, are essential to a favourable termination.

CHAPTER III.

HEMORRHAGE OF THE CUTANEOUS TEXTURE.

HEMORRHAGE from the skin may appear under two forms, either that of a bloody or blood-coloured fluid coozing from certain regions of the skin, or of blood effused in the form of purple specks, spots, patches, or livid stripes on the surface of the true skin or corion, and below the scarf-skin. The former discharge is rare, and takes place chiefly as a supplementary evacuation to some natural one which has been suppressed, *e. g.* the menstrual discharge in women. The latter is of a different nature; and, as it is both the effect and the proof of a morbid state of the system, it demands the attention of the pathologist.

Restricted in this manner, hemorrhage from the skin may take place in two modes; either when the skin alone is affected, or when it is affected in common with other membranes and tissues of the animal body. The first case constitutes the simple purple disease of authors, the *Purpura simplex* of Willan and Bateman; of the second we have examples in the bleeding or hemorrhagic purples, *Purpura hæmorrhagica* of Willan and Bateman, the land-scurvy of popular writers, and in the genuine sea-scurvy, the *Scorbutus* of authors.

§. I. Land-Scurvy. *Purpura Simplex*; *Purpura Hemorrhagica*.

Observations on the Utility of Venesection in Purpura. By C. H. Parry, Physician, Bath. Edin. Med. and Surg. Journ. v. p. 7. Edin. 1809.—Quarterly Report of the Carey Street Dispensary. Ibid. Vol. vi. p. 124. Edin. 1810.—A Case of Purpura Hemorrhagica. By Thomas Jeffreys, M. D. one of the Physicians of the Dispensary and Fever Hospital, Liverpool. Ibid. Vol. viii. p. 435. Edin. 1812.—Extract of a Letter from William Harty, M.D. Dublin, relative to the use of Purgatives in Purpura. Ibid. Vol. ix. p. 186. Edin. 1813.—The History of a Case of Purpura Hæmorrhagica. By G. D. Yeats, M.D. Transactions of the College of Physicians, London, Vol. v. p. 429. Lond. 1815.—Report of the Carey Street Dispensary. Edin. Med. and Surg. Journ. xii. p. 249. Edin. 1816.—Report, &c. Ibid. xiii. p. 402. Edin. 1817.—Observations on the Nature and Cure of Dropsies, &c. By John Blackall, M.D. &c. 3d Edition, Lond. 1818. Chapter viii. Cases resembling Land-Scurvy, p. 153.—Case of Purpura Hæmorrhagica with Remarks. By James Combe, M.D. &c. Edin. Med. and Surg. Journ., xvii. p. 83. Edin. 1821.—Case of Purpura Hæmorrhagica. By George Johnstone, M. D. Surgeon, &c. Edin. Med. and Surg. Journ. xviii. p. 402. Edin. 1822.—Case of Purpura Hæmorrhagica. By Andrew Duncan, Junior, M.D. &c. Ibid. p. 405. Edin. 1822.—Observations on the Treatment of Purpura Hemorrhagica, &c. By Whitlock Nicholl, M.D. Ibid. p. 54.—Pathological Observations, Part I. on Dropsy, Purpura, and the Influenza. By William Stoker, M. D. Edinburgh &c. Dublin, 1823. 8vo. Pp. 244.—History of a Case of Purpura. By Dr E. Gairdner, M.D. &c.—History of a Case of Fatal Purpura. By William Wood, Fellow of the Royal

College of Surgeons, Edin. Transactions of Medico-Chirurgical Society, Edin. Vol. i. Edin. 1824.—Case of Hæmorrhœa Petechialis successfully treated by Purgatives. By John Darwall, M. D. Birmingham. Edin. Med. and Surg. Journ. xxiii. p. 53. Edin. 1825.—Case of Purpura Hæmorrhagica, successfully treated with Spirit of Turpentine. By Joseph Joy Magee, M.D. Dublin. Ibid. xxiv. p. 307. Edin. 1825.—Case of Hereditary Hæmorrhœa. By Theodore Davis, Nailsea. Ibid. Vol. xxv. p. 291. Edin. 1826.—Case of Hereditary tendency to Hæmorrhagy. By Dr Elsaesser. Ibid. p. 454.—Cases of Hæmorrhœa Petechialis in individuals related to one another. By Alexander Murray, Alford. Ibid. Vol. xxvi. p. 33.—Case of Hemorrhage from Hereditary tendency, Ibid. xxxii. p. 439. Edin. 1829.—On the Efficacy of Mercurial Purgatives in Purpura, whether simple or Hemorrhagic, &c. By William Harty, M.D. Ibid. xxxiv. p. 57.—Remarkable instance of Hemorrhagic tendency in a family, Edin: Med. and Surg. Journ. Vol. xxxvi. p. 217. 1831.

THE two forms of disease named Purpura have been long known among authors under the name of *Petechiæ sine febre*, because they consisted of minute purple specks or spots, like *petechiæ*, but were unconnected either with ague or continued fever. It must not, however, be imagined that they are therefore unaccompanied with derangement of the functions; for in the mildest form the individual is languid and feeble, his look is pale and dingy, and he complains of pains in the limbs; and in the more severe, he is oppressed with a sensation of languor, weariness, and faintness, a peculiar gnawing pain at the pit of the stomach, and severe bruising pains of the body, back, and limbs. There is reason to believe that these two are different degrees only of the same disease.

A. According to Willan, to whom we are indebted for the first accurate accounts of this disease, the mild variety is most common in women and children who live on poor diet, and use little exercise. Without much sensation of illness, an eruption of dark-red or purple spots appears on the skin of the legs, arms, breast, and belly. These spots, which precisely resemble the petechiæ observed in bad fevers, are most numerous on the breast, and on the inside of the arms and legs, and may be of various sizes, from that of a flea-bite, to that of two lines in diameter; on the legs they are usually larger, and sometimes become confluent in irregular patches. At the same time the patient complains of general weakness and languor, the skin is dry, harsh, and imperspirable, there is some thirst, the appetite is weak, and the muscular strength is impaired; but the pulse is not materially altered.

The petechial spots are to be distinguished from flea-bites by the absence of a central puncture; and with the symptoms now enumerated the disease will be readily recognized.

It disappears in general under the use of gentle purgatives, proper food, the mineral acids, and exercise.

B. The severe form of purple disease is distinguished by the greater degree of constitutional disorder, and by the hemorrhagic action being extended to almost all the textures of the human body. It may come on either slowly after some undefinable disorder of the frame, or suddenly when the individual is in the apparent enjoyment of the most perfect health.

For some weeks previous to the appearance of purple spots, the patient complains of an oppressive sensation of languor, weariness, faintness, and gnawing pain at the pit of the stomach. The appetite is variable, generally weak, but sometimes with an inordinate craving for food; and when this is taken it lies with weight and sickness on the stomach, without imparting the vigour and comfort which food does in the healthy state. At the same time the tongue is yellowish, or may be red, but coated with a viscid fur; there is some thirst; the skin is cold, and unctuous or dry; and the countenance is either sallow and dingy, or has the bloated appearance peculiar to the leucophlegmatic condition. When these symptoms have continued a few weeks, purple circular spots appear first on the legs, and afterwards, without any certain order, on the thighs, arms, and trunk of the body. In some instances their appearance is immediately preceded by shiverings, squeamishness, bilious vomitings, and acute pains of the limbs, referred to the bones. But in whichever mode they are introduced, their presence is always attended with great depression of spirits, and much weakness of the corporeal powers. The pulse is feeble, sometimes a good deal quicker than natural; and heat, flushing, transitory perspiration, and other marks of feverish disorder, recurring like quotidian or hectic paroxysms, may be observed.

In some patients, deep-seated pains are felt about the epigastric region, and in the chest, loins, or belly; in others there is giddiness and lightness of the head, especially when attempting to move, or even dull pain in some part of the head; in some considerable cough, weight, and a sense of tightness in the chest, with a languid, sighing state of respiration, are the most obvious symptoms; in others, swelling and tension of the epigastrium and hypochondres, with tenderness on pressure, and a constipated state of the bowels, are the principal complaints; and in a few, palpitation, irregular action of the heart,

and frequent syncope have occurred. I shall immediately mention circumstances which render it probable that the several modifications of the attending symptoms depend on the greater or less affection of the organs of the head, chest, and belly respectively.

When the spots appear first they are bright red; but in a day or two they become purple or red, afterwards brown, and when they are about to disappear they assume a yellowish tint; so that when the disease has continued for a few days without showing any tendency to terminate, the same patient may present bright red spots newly formed, purple ones, which have continued for some days, and brownish or yellowish spots, which are fading. They are generally larger than in the mild form of the disease; they may be few and distinct, or numerous and coherent; they may be distributed regularly over the whole cutaneous surface, or grouped in irregular clusters; but they are generally attended with livid stripes or patches of various size and shape (*vibices*); and the slightest pressure of the skin may be followed with a large blue mark or purple blotch, as if it had been bruised. In some instances, even the cuticle has been observed to be elevated into vesicles or large purple blebs or blisters (*phlyctænae*), containing a bloody or purple serous fluid. These spots consist of blood or bloody fluid effused on the outer surface of the corion.

But the skin is not the only membrane affected in this disease. The mucous membranes, the serous membranes, the synovial, even the substance of organs may present the same effusions of blood.

Among the first, we find that the inside of the mouth, the gums, the palate, throat, and nostrils are affected with similar spots, more frequently with minute purple vesicles, formed by the elevation of the mucous epidermis. At the same time discharges of blood, more or less copious, take place from these surfaces, either in the form of an incessant oozing, or of a sudden and profuse hemorrhage. In this manner blood issues not only from the nostrils, gums, mouth, and throat; but from the eyelids or ears; from the lungs, stomach, or intestines; from the uterus in females; and from the bladder and urethra in both sexes. These hemorrhagies are not easily checked, and if they are in quantity, they return frequently, and, in some instances, at a stated hour daily.

The internal organs which are most commonly and most seriously affected in hemorrhagic purpura, and, indeed, it may be said in simple purpura, are the lungs and the alimentary canal. In most cases of simple purpura, I have found that the respiration is more rapid than usual, from 30 to 36 in the minute; that there is some cough, occasionally both urgent and frequent; and if the stethoscope be used, I have found, instead of healthy respiration, vesicular respiration, obscured or rather extinguished by a dull crepitating rattle with large bells, while in some parts of the lungs, especially corresponding to the large bronchial tubes, the respiration is bronchial. These symptoms are still more intense and more strongly marked in the hemorrhagic purpura.

In several cases of purpura, especially with hemorrhage, the motions are dark-coloured, tarry, and glassy, or like molasses, and evidently derive these characters from the presence of blood which has oozed from the mucous surface of the stomach, the ileum, and the colon.

From these facts I infer, that in the purple disease there is always more or less disorder of the lungs and other internal organs; and that this disorder of the lungs consists in the presence of a sort of peripneumony and vesicular *bronchitis*, in which blood is effused in the filamentous or parenchymatous tissue of the lungs, and also in the small tubes and vesicles. In those cases in which this effusion is not absorbed either spontaneously or under the employment of treatment, the disease proceeds to the fatal termination, either by profuse continued hemorrhage, or by suffocation, or both combined.

That the same sort of purple spots and effusions of blood take place from the serous membranes is established by the dissection of fatal cases, in which these spots have been found in various degrees of extent in the arachnoid membrane, in the *pleura* and *pericardium*, and in the *peritoneum*, and occasionally fluid or coagulated blood in the cavities formed by these respective membranes. Even the substance of the brain, lungs, heart, liver, and other solid organs has not been exempt in some severe and extreme cases. Blood has been found also in the alimentary canal; and in the cavity of the peritoneum. And, lastly, blood has been found in the calyces and pelvis of the kidney, and within the urinary bladder.

The duration of the purple disease is various; nor can it be

said to have any regular or stated termination. It may be protracted from three weeks to twelve months or upwards. In some instances it has terminated in a few days ; in others it has been known to prevail in various degrees of severity for many months ; and in some persons it appears to be so constitutional, that the slightest scratch will produce hemorrhage, and the slightest bruise one or more large livid patches. It is also to be remarked, that instances occur in which blood oozes or is discharged more or less copiously from the mucous membranes, without affection of the skin, as has been above noticed, that the skin may be affected while the mucous membranes are untouched. It is to this head that are to be referred the cases of profuse or fatal hemorrhage from slight causes, so many examples of which are recorded by authors under the name of *Hæmorrhœa*, constitutional or hereditary.* If the fatal event is not accelerated by hemorrhage, gradual or sudden, and the disease is still protracted, the patient becomes sallow, wax-coloured, and dingy ; anasarcaous swelling, and gangrenous or bad sores of the extremities succeed, general dropsy is formed, and the patient dies exhausted.

In cases of the kind now mentioned, I am satisfied that the appearance of purple spots is connected with more or less disease of the heart. Several instances of simple purpura I have seen take place along with, or in the course of, disease of the heart, especially hypertrophy or dilatation of the ventricles. In such cases there is strong reason to believe, that the occurrence of the purpura depends on imperfect *hæmotosis*, as well as impeded circulation, both through the system and through the lungs. The coagulating power of the blood is impaired, in consequence of the function of the lungs being enfeebled ; and besides this the blood is not perfectly circulated, or is rather impeded in its progress ; and from these two causes proceed the formation of the red spots and the other marks of extravasation, at least in the form of the distemper.

The exciting causes of this disease are not well known. It is generally observed more commonly in women than in men ; more in boys before puberty than after ; and more in the feeble and delicate than in the robust and vigorous ; it appears after the long use of poor diet, after much sedentary occupation, watching, or much mental distress and anxiety. At the same

* See Edinburgh Medical and Surgical Journal, Vol. xxv. p. 291 and 451.

time it has also been frequently observed in persons accustomed to the use of nutritious food and free living; but in whom, there is reason to believe, the digestive functions and the constitutional powers had been impaired by the habitual use of wine, spirituous liquors, and other unnatural stimulants. Willan* remarks it to be frequent in London in children who live well, and were under no particular restraint; and, in the absence of more obvious causes, he ascribed it to the impure air of a large and crowded city, and the want of the salubrious exhalations of growing vegetables. It is to be observed, however, in opposition to this, that it has been found in young persons living in the country, previously enjoying good health, with all the necessaries and comforts of life.† Like other diseases of this nature, its formation seems to depend much on imperfect clothing, and the derangement which the cutaneous secretion undergoes from this cause.

The pathology of this disease is not better understood than its etiology. When I have said that it is a hemorrhagic disease of the skin, mucous membranes, serous membranes, or it may be of every texture and organ of the body, I have said all that is known, and have nevertheless merely expressed a general fact without attempting to explain it. There must be some cause, some previous circumstance concerned in the formation of this general hemorrhage; but what that is has not been ascertained.

A peculiar state, either of the capillaries at large, or of the blood contained in them, or of both together, appears to be the most rational conjecture. But of the nature or essence of this peculiar state nothing is known. Of the condition of the capillary vessels during the purple disease, nothing is ascertained save that they are fuller than usual; and if it were, it is not easy to see in what manner it could explain the phenomena of the disease. In some cases of the purple disease I have observed the blood drawn to coagulate into a loose, tremulous mass, without showing any serum; and Dr E. Gairdner remarks on a case described by him in the Transactions of the Medico-Chirurgical Society of Edinburgh, that the serum by rest undergoes a slow but spontaneous coagulation. It appears further from the observations of Dr Combe, that the urine contains an excess of

* Reports, p. 206.

† See the Case by Dr Yeats, in Medical Transactions, Vol. v. p. 429.

albuminous matter, with a deficiency of urea. These several facts show that there is some peculiarity in the composition of the blood in persons affected with land-scurvy; that one of the characters of this peculiarity is a deficiency in the coagulating power of the blood, causing the appearance of a great proportion of albuminous matter; but whether this is cause, effect, or accompanying circumstance is quite unknown; and how it can be applied to illustrate the nature of the disease is equally unknown.

This disease is to be distinguished from *epistaxis*, *hæmoptysis*, or any of the other active hemorrhagies; and from true sea-scurvy.

The treatment of the purple disease has given rise to some discussion, and not a little difference of opinion. Impressed with the notion of putrefaction and dissolution of the blood, and tendency to gangrene, the elder physicians recommended liberal doses of bark, and such stimulating or aromatic medicines as were supposed to possess antiseptic powers, the mineral acids and other tonics, which might act as styptics on the bleeding capillaries, and as ample allowance of nutritious food and wine as the stomach of the patient would bear. This was the treatment adopted not only by Cullen, Duncan Senior, and others, but at a much later period by Willan. "It is proper," says he, "to recommend a generous diet, the use of wine, Peruvian bark, and acids, along with moderate exercise in the open air, and whatever may tend to produce cheerfulness or serenity of mind." (Reports, p. 207.) The propriety of this mode of treatment was first questioned by Dr Parry of Bath, who found that a full bleeding from the arm was a much more speedy mode of curing the disease. (Medical and Surgical Journal, Vol. v. p. 7.) Not long after, Dr Harty of Dublin, after having witnessed the death of a patient who was treated in the ordinary way with nutritious food and tonic medicines, found that he was uniformly successful in more than a dozen of cases, which were treated by liberal doses of purgatives, so as to clear out the intestinal canal completely, and restore the healthy state of its secretions. Dr Bateman admits the propriety of the tonic treatment recommended by Willan in children affected with the disease from bad nursing and deficient food, in women exposed to similar causes of disorder, and in feeble and delicate subjects in general; but re-

gards them as ineffectual and injurious in adults, previously in good health, or plethoric, and when the disease is accompanied with white loaded tongue, quick, sharp, and small pulse, and especially if there are chills and heats, fixed internal pains, cough, an irregular state of the bowels, or other symptoms of internal disorder. I have seen cases of the purple disease treated in both modes; and I can assert, from personal experience, that, while the mode of treatment by purgatives and blood-letting, according to circumstances, is never attended with the bad effects which were apprehended by the older physicians, the course of the disease is invariably shortened, its symptoms are alleviated, and it is entirely removed with much greater certainty, than by the tonic treatment, by means of nutritious food, bark, and wine, or other stimulants.

Upon the whole, therefore, the treatment of land-scurvy may be comprised in the following measures. The bowels ought invariably, and without exception, to be first thoroughly and effectually evacuated by means of senna, aloetics, or calomel and jalap. If several effectual doses of either or all of these medicines be not followed by less heat of skin, diminution of the frequency of the pulse, abatement of the internal pains, and a cleaner state of the tongue; if the spots continue to increase in number and size, and the hemorrhagic oozings do not cease;—twelve, fifteen, or twenty ounces of blood, according to age, strength, and other circumstances, must be drawn from the arm, while the patient should abstain from animal food in every form, and should subsist on boiled rice with whey, or the light subacid fruits, as grapes, oranges, strawberries, gooseberries, baked apples, or the like. His drink may consist of tamarind water, or water acidulated with sulphuric acid. Under this plan most cases of the disease will be speedily and readily brought to a favourable termination. If symptoms of local uneasiness continue after the urgent phenomena have disappeared, leeches should be applied in the neighbourhood of the part; and it will be proper to continue the periodical and regular evacuation of the alimentary canal. When the spots have disappeared, and the hemorrhage has ceased, the constitution recruits rapidly under the gradual but cautious use of light soups, and fresh fruits and vegetables. Bark, the mineral acids, and chalybeates have been recommended during convalescence, as of great moment in accelerating the restora-

tion of strength; but the best tonics will be found in the assistance which light diet derives from fresh air, gentle exercise, and the use of flannel clothing for some time. Cold sponging, by cleansing the skin and maintaining the healthy state of its circulation, will be useful in preventing a relapse.

§. II. Sea-Scurvy; Scurvy. Scorbutus.

A Treatise on the Scurvy, in three parts, &c. By James Lind, M. D., the third edition. London, 1772.—F. Milman on Scurvy and Putrid Fevers. London, 1783.—Observations on the Scurvy, with a review of the opinions lately advanced on that disease, &c. By Thomas Trotter, 2d edition. London, 1792.—D. Paterson on the Scurvy. Edinburgh, 1795.—*Medicina Nautica*. An Essay on the Diseases of Seamen, &c. By Thomas Trotter, M. D. London, 1797, 3 vols.—Observations on the Diseases of Seamen. By Gilbert Blane, M. D. 3d edit. London, 1799.—Account of the Diseases of India as they appeared in the English Fleet, &c. By Charles Curtis, formerly Surgeon of the *Medea* Frigate. Edinburgh, 1807, 8vo, p. 9, 15.—Some Observations on the Scurvy. By W. Heberden, M. D. *Med. Trans.* Vol. iv. London, 1813.—Report from the Select Committee on the state of the Penitentiary at Milbank. Ordered by the House of Commons to be printed 8th July 1823, folio, Pp. 399.—Observations on Sea-Scurvy, as it occurred during a passage from Bombay to England. By George Kirk, M. D. *Edin. Med. and Surg. Journal*, Vol. xxxii. p. 45. 1829.—The result of Experience in Sea-Scurvy, with Remarks on Prevention and Treatment. By Andrew Henderson, M. D., &c. *Edin. Med. and Surg. Journal*, Vol. lii. 1839.

THE first symptom indicating the approach of sea-scurvy is in general a change in the colour of the face, which, instead of being ruddy and clear, with the features well-marked, becomes pale, dingy, waxy-looking, and bloated, with languor, listlessness, and aversion to exertion either of mind or body. The lips also and the angles of the eyes assume a greenish tint; and sometimes the complexion acquires a dirty-yellow, tending to a darker colour. Soon after the gums become soft, bluish, and swollen, and easily bleed, forming the symptom named *stomacace*; and the breath at the same time exhales an offensive heavy fetid odour. The nose is also liable to discharge blood.

The skin of the whole body, but particularly of the extremities, is cold, dry, and harsh, very generally rough and papulated, forming the *cutis anserina*; and that of the legs presents, in general, numerous spots of various shades of redness, but generally tending to the purple tint. These spots vary in size, from the bulk of a pin-head to that of a tare or split pea, and in some instances, two or three coalescing, form irregular-shaped, large, dark purple patches. Though these spots appear partly on the legs and thighs, they speedily show themselves on the arms, the trunk, and even on the neck and about the

face. It is not uncommon, also, for hard knotty masses to be formed in the skin and cellular tissue of the legs, and afterwards that of various other parts of the body. At the same stage of the distemper, it is observed that a blow, a contusion, a fall, or even considerable pressure, for instance that of a garter, is followed by the formation of a dark-red, or bluish or livid mark or stripe on the skin, and which is evidently caused by extravasation of blood.

Meanwhile the legs swell and become cedematous, especially at night. The swelling appears much in the same manner as dropsical swellings, affecting first the ancles and feet, and disappearing towards morning; and then the legs and thighs, and subsiding less completely until it becomes constant. This swelling is accompanied with greater pain than in the case of ordinary dropsical swellings, is firmer, not yielding so readily to the impression of the finger, and retaining longer the impression once made.

As the disease advances, the sense of lassitude, languor, debility, and depression of spirits daily increases, and becomes quite overpowering. In this stage of the disorder, any sudden motion is liable to be followed by faintness and swooning; and, in some instances, men have expired in the course of being conveyed from one part of a vessel to another, or being conveyed in a boat to the shore.

Though this is the usual mode in which the disease appears, variations take place, and the course of the symptoms also varies.

In some instances, the first indications of scurvy appear either in wounds or fractures, or similar injuries, or in their cicatrices. Thus if a person have a fracture of the leg or arm, or any other bone, which appears proceeding prosperously to union, the uniting or newly united part becomes quickly soft and loose; the leg itself becomes swelled and painful; the skin is dry and harsh, and is soon covered with reddish spots; and it is found that the fracture, which had been nearly or altogether united, is again loose, crepitating, and moveable. In the case of compound fractures, the wound becomes soft, bluish, and bleeds; and in no long time presents the character of the scorbutic sore.

Scorbutic sores are either those ulcers which a person may have at the time at which he is attacked by the symptoms of scurvy; or they are the result of the cicatrices of former sores

long healed, but which have begun to be affected by the scorbutic diathesis.

In the former case, in a sore which has been granulating in a healthy manner, instead of the red small firm granulations, with the moderate purulent discharge of the healing process, more or less quickly, the granulations become large, glassy, spongy, and dark-red, and the secretion is a sort of bloody or dark-red serum mixed with blood, and generally offensive, mawkish or fetid in smell. The latter gradually coagulates on the surface, and is not easily separated from the subjacent parts; and when it is removed, it is usual to find either the granulations absorbed, or the whole surface flat, spongy, reddish, and presenting no appearance of granulation. When this coagulated or softened blood is removed, it is very quickly succeeded by a fresh quantity of the secretion. The edges of the sore are bluish, and elevated by excrescences of soft spongy bleeding granulations. When much pressure is applied, they become still darker in colour, and the neighbouring parts are swelled, painful, and of a blue colour, or covered by bluish spots, or of a dark-yellow tint. As the disease advances, from the surface of the sore arises a soft dark-coloured substance, of fibrous consistence, similar to gore, (*fungus scorbuticus*,) and which bleeds on the slightest touch. To this the seamen have been in the habit of applying the characteristic name of bullock's liver. If much violence be applied to this, either by the knife, irritating or caustic applications, or otherwise, it in general bleeds profusely, and, though removed and destroyed, it is reproduced in the course of a single night.

In the same manner, former wounds and sores, that have been long healed, begin again to be painful, to give way, or to break out, as it is called, and discharge bloody fluid or blood; and the slightest scratch or puncture is liable to degenerate, in such a state of the system, into a foul, bluish-coloured bleeding sore, with fungous granulations, and more or less hemorrhage.

Besides the appearances in the exterior surface now mentioned, various changes take place in the functions of the internal organs. The head is not often affected with pain. But the functions of the brain are always, in the confirmed stage, more or less disturbed. Besides the listlessness, and languor, and weakness of mind, the memory may be impaired, the judg-

ment weakened, and the patient is liable to be gloomy and despondent, often sheds tears, and becomes hysterical.

The breathing is always a little more rapid, and greatly more laborious than natural. It is at the same time feeble, as if the patient was unable to move the muscles of the chest. Often he has cough, and sometimes brings up blood by expectoration. Pains in the side and various parts of the chest are common. In general they are aggravated by deep or full inspiration; but they are also aggravated by pressure. The pain or pains are at first transitory, and shoot from one part of the chest to another, but afterwards they become fixed in a particular part, frequently the side, becoming severe and pungent, affecting the breathing, and then indicating considerable danger.

The action of the heart is always feeble, not necessarily rapid; but sometimes irregular and intermitting.

The appetite is, in general, not much impaired, but is often rather keen, and, indeed, it may be preternaturally active. Nutrition, however, is imperfect, as the strength, instead of increasing, is daily diminished.

In the early stage of the disorder, and even before its appearance, the bowels are bound, and the motions scanty. As the disease proceeds, tormina or griping pains come on, and are followed by liquid stools, with tenesmus, and afterwards the discharges consist of blood-coloured or dark-coloured motions, and sometimes large quantities of pure blood are voided.

The urine is scanty and high-coloured, and sometimes tinged with blood.

In general, as the disease proceeds, and, in some instances, even at an early period, the tendons of the hams and ankles become stiff, painful, and swollen, so that the patients lose the power of walking. If, however, this symptom have not appeared early, it seldom fails to take place in the course of the disorder, and adds much to the sufferings and helplessness of the patient. It constitutes the *Skelotyrbe* of nosologists.

In some instances, perhaps not very frequently, *Nyctalopia*, or night-blindness, takes place, so that, as night approaches, vision is impaired, and sometimes complete blindness ensues. It is possible that this disorder of vision may depend on the effusion of blood in the retina or choroid coat, or the formation of similar spots in them, which, though not sufficient to cause blind-

ness during the day, might do so in the faint light of night. This symptom is stated by Sir Gilbert Blane to have been common in the garrison of Gibraltar among those affected with scurvy during the siege.

As the disease proceeds, the symptoms of feebleness of body and imbecility of mind become more conspicuous. The gums become softer and more spongy, and bleed frequently or incessantly; while the teeth are denuded, and sometimes drop out. The breath emits a fetid odour. Blood oozes or flows from the nose, mouth, lungs, stomach, bowels, and kidneys, and reduce the patient to the last stage of debility.

In this state of matters the disease may terminate in various modes.

First, in recovery under the use of remedies, and sometimes spontaneously, or by the influence of the exhilarating passions; *secondly*, in dropsy, with a general cachectic state, or in jaundice; or in mental derangement, with great despondency, or suicidal monomania; or in scorbutic dysentery, with rapid and fatal wasting; *thirdly*, in fatal hemorrhage from the lungs or the intestinal tube; *fourthly*, in fatal syncope; and *fifthly*, in a combination of syncope and asphyxia.

Regarding these modes of termination it may be observed, that the cases of sudden death, so common in this disease, are said to be often occasioned by rupture of a blood-vessel, and discharge of blood into some of the great cavities of the body, as the ventricles of the brain, the pleura, and pericardium in the chest and the peritoneum in the belly. In several instances, however, no blood-vessel will be found ruptured; and the blood may be discharged from the surface of the respective membranes of these cavities, in the same manner as in the hemorrhagies of the serous membranes.

In other instances, in which the fatal termination has taken place not suddenly, but more slowly, large quantities of blood or bloody fluid are found within the cavity of the pleuræ.

MORBID ANATOMY.—The appearances vary according to the stage of the disorder, and the methods of treatment.

The brain is most usually found loaded with bloody serum, both in its vessels and its membranes, and also a good deal of soft loose gore is found in the larger vessels, especially the veins. The lungs are dark-coloured, softened, loaded with loose soft gore, and in general a considerable quantity of serous fluid is found within the cavity of both *pleuræ* and in the

pericardium. In some instances, bloody fluid or gore is found in the cavity of one or both *pleuræ*.

In like manner, fluid is found in the abdominal cavity.

But in those in whom death is immediate or very sudden, fluid is not always found in the cavities of the serous membranes. Adhesion of the costal to the pulmonic *pleuræ*, and of the pericardium to the heart, were found in some instances. In others, the auricles were distended with a large quantity of dark-coloured blood; and in others, the muscles are blackened and softened, with much dark-coloured blood, or rather gore. In most cases, indeed, large masses of semicoagulated gore were found extravasated in the bellies of the muscles and in the periosteum.

The bones are also darkened, and, in some instances, the epiphyses are detached from the bones, and a grating noise is perceived. This occurs chiefly in younger persons, about 18 or 20 years of age.

PATHOLOGY.—Different modes have been adopted of explaining the phenomena and effects of scurvy. From the hemorrhagies, the bloody or sero-sanguine discharges from wounds and sores, and from the appearances of extravasation found in various parts of the body, together with the putrid odour of the breath, a very general idea was, that it depends on putridity, putrescence, or corruption of the blood. This notion of the corrupted and putrescent state of the blood in scurvy was espoused by Lind at first, by Sir John Pringle, by Cullen, and by Macbride, who ascribed its corruption to the loss of carbonic acid gas.

The idea of the putrid state of the blood was, however, soon renounced by Lind, who, from repeated examination of this fluid in scorbutic subjects, was satisfied that it exhibited no proof of corruption or putrefaction. In short, it is absurd to suppose the blood to have undergone any degree of elementary decomposition while life continues; and while the circumstance of the blood coagulating in the early stage is sufficient to prove that its fibrine is not much changed, its diminished coagulating power in the confirmed and concluding stage does not indicate decomposition. It was on this account that Lind latterly announced the opinion, that whatever weakens the constitution, and especially the organs of digestion, may serve, without any other cause, to induce this disease in a slighter or higher degree even among such as

live on suitable food, and enjoy pure air. This hypothesis, though too vague and general, was made the ground-work of that of Sir Francis Milman, who, considering scurvy as a disease not of the fluids, but of the solids, placed its seat in the muscular fibre, and pronounced its proximate cause to consist in the gradual diminution of the vital power, by the remote causes of the disease. Not, perhaps, very different is the conjecture of Sir Gilbert Blane, that it consists in a defect of the living tone and irritability of the fibres in general, particularly those of the vascular system; and also a diminution of their simple elasticity and cohesion.* Not long after, Dr Trotter inferred, from the chemical constitution of the substances most efficacious in removing the symptoms, that the prominent cause was nothing else but the abstraction of vital air, or oxygen, from the body, by the operation of the remote causes.†

It is not difficult to see that neither of these hypotheses afford any satisfactory information, either on the pathological nature of this disease, or on the process by which it is generated; and perhaps it is to be ranked among those subjects, which the present state of physiology and of chemistry is not yet competent to explain.

There is, nevertheless, one circumstance in the state of the blood that deserves notice. When blood is drawn in the early stage of the disorder it may coagulate, giving a good proportion of serum. But when drawn in the confirmed and advanced stages, it coagulates imperfectly, and almost no serum is separated from the blood. The blood also discharged from the mucous and serous surfaces, and from sores and wounds, undergoes a very imperfect species of coagulation, or rather is not coagulated, but is converted into a species of soft semifluid gore, generally very dark-coloured.

These facts lead to the conclusion, that, though the blood is not putrid, or corrupted in the just sense of that term, yet it has lost in a great degree its self-coagulating power.

The next question which suggests itself is, how does this change take place? This it is difficult to answer. But when it is considered that the coagulating power of the blood seems to bear an intimate relation to the integrity and energy of the function of respiration, it may be inferred that the initial

* Observations on the Diseases of Seamen, p. 497. 3d edition, 1799.

† Observations on the Scurvy, 2d edition, 1792, p. 140.

point of scurvy is to be found in the imperfect action of the lungs on the blood, or in the blood losing by some means its self-coagulating power. The blood of reptiles is less coagulable than that of animals with perfect lungs, as the Mammalia and Birds. But the ultimate prosecution of this inquiry would lead me beyond my limits.

For the reasons above assigned it is impossible to approach the intimate nature or formation of scurvy, more nearly, than to remark its occurrence after particular modes of living, and the long use of certain articles of diet, aided, as there is reason to believe, by corporeal inaction, bad air, an atmosphere either unusually moist or unusually calm, whether in a hot or cold climate, imperfect clothing, and lastly, mental dejection or anxiety. It is in this manner that the occurrence of scurvy has been said to depend on a combination of several or all of the following circumstances.

1. A moist or maritime atmosphere, especially if it be also cold ; 2. situations in which corporeal exercise is prevented or neglected, as confinement on shipboard, in prisons, and from the effects of laziness or indolence ; 3. mental dejection and despondency ; 4. neglect of cleanliness and want of adequate shelter and clothing ; 5. imperfect supplies of nutritious food and wholesome drink, and want of change in food, especially a monotonous and unvaried sort of diet, under which is included the constant use of salt provisions.

1. *Moist or Sea Atmosphere.*—It was at one time supposed that scurvy occurred chiefly in cold climates and seasons, and this condition has been inserted in the definition by Cullen. Thus, it is known to be endemial in Greenland, Iceland, Newfoundland, Canada, Spitzbergen, the north of Russia, Asia, &c., as at Cronstadt in 1731 and 1786, at Wiborg in 1732, and at Petersburg in 1733, at Ust-Samara in 1737, at Asoph in 1736-7; to occur frequently in the Greenland ships and others cruising or sailing long in the Northern seas ; and to be endemial formerly in the Netherlands, in Holland and Friesland ; in Brabant, Pomerania, and Lower Saxony, and in some parts of Denmark, Sweden, and Norway, especially about the sea-coast. Nor is it only to long and distant voyages that the occurrence of scurvy is peculiar, for it has been found universally to appear in a much shorter time among the crews of vessels cruising in the narrow seas of the *Baltic* and *English Channel*, or

upon the coasts of Norway and Hudson's Bay, than in others continuing the same length of time in the middle of the Atlantic, or in performing a voyage to India. (Lind, p. 60.)

Even cold air without moisture seems not to be entirely guiltless in the production of scurvy. Thus, it is known that in Greenland, in the Danish colonies settled there, where there is no humidity, because frost reigns for several months, but where the inhabitants are precluded from exercise, scurvy used to be very prevalent, and destroyed great numbers of the colonists. It appears to have been one of the diseases designated as the Black Death. In proof of the same fact, it may be mentioned, that in Captain Franklin's expedition several of the persons presented symptoms of scurvy. Here, however, the influence of scanty meagre fare was also in operation.

But the appearance of scurvy is not confined to cold seasons or climates. Thus, the ship's company of Sir Richard Hawkins, on a voyage to the South Sea, in 1593, was attacked with distinct and violent scurvy, within three or four degrees of the equinoctial line. It attacked the crews of Lord Anson not only when he was passing round Cape Horn, where he had to contend with cold and tempestuous weather, but again more severely, if possible, when sailing between Chequetan, on the coast of Mexico and the Ladrone Islands, when they were still between the equator and the tropic of Cancer. In 1781, it appeared in a squadron of Lord Rodney's fleet, when cruising off Martinico, in a greater degree, according to Sir G. Blane, than had ever been known in the West Indies; again to a considerable degree in 1782, when near Jamaica, (94); and afterwards on a voyage between that and New York, (116.) Dr Trotter gives an account of an epidemic of scurvy which broke out among the slaves of a Guineaman, in February 1784, when lying in Anamaboo Road, off the Gold Coast, in north latitude 5°. Sir James M'Gregor saw it take place in the 88th Regiment when stationed on the Island of Culaba, near Bombay, in July and August 1800;* and next year to the amount of twenty cases in the 61st Regiment, when stationed at the Pharos, in Egypt, though at a time when the army was liberally supplied with fresh vegetables; and there was no scarcity of

* Memoirs on the State of Health of the 88th Regiment. By James M'Gregor, A. M., M. D., &c. Edin. Med. and Surg. Journal, Vol. i. p. 266. Edinburgh, 1805.

provisions in the market.* Mr Bampffield saw it when in harbour, in a vessel land-locked at Trincomalee ; and he states that, though the allowance was one pound of fresh beef daily to each man, and, as is got in the East Indies, with a small quantity of vegetables, yet in one week after the men were placed on this diet thirteen cases of scurvy occurred. (Milbank Penitentiary Report, p. 87.)

2. *Corporeal Inaction*.—This appears to be the reason of the occurrence of scurvy not only in ships, but in blockaded towns, as Breda, in 1625, Thorn, in 1703, and similar situations, as at Fort William in Scotland, in 1752. Captain Cook remarks that the Kamschadales, who were habituated to hard labour, and the coarsest fare, were free from scurvy, while the Russians and Cossacks, who were in garrison in their country, and led indolent lives, were subject to it, though using the same or better food. The ships of the channel fleet in 1794 and 1795 suffered much from scurvy when at Spithead, though the men were fed with fresh beef, and had a suitable allowance of good beer. In 1798, when all the French prisoners could not be accommodated in Portchester Castle, part of them were lodged on board of a ship in the adjoining creek, and were victualled in the same manner as those in the castle, on fresh animal food and pease, without any salt provisions ; yet true sea-scurvy broke out in the ship, but not in the castle. These facts seem to show, that the formation of scurvy depends greatly on the want of exercise and fresh air. (Blane, 481, 482.) It was, perhaps, from the same cause, aided by humidity, that the disease appeared, as has been already noticed, in Lord Anson's crew, between Mexico and the Ladrone Islands, when they had not only a considerable stock of fresh provisions, but were daily catching fish, and had a liberal supply of fresh water. (P. 112, Walter.)

3. *Mental dejection*, arising either from disappointment, long confinement, or the dull, unvaried, and monotonous life necessarily imposed by a long voyage, is certainly of no small power in producing scurvy. The same cause will operate powerfully in besieged towns, garrisons, jails, and similar situations. The prevalence of scurvy in such places, as the Bicêtre, and its appearance in the Penitentiary at Milbank, are probably to be ascrib-

* Medical Sketches of the Expedition to Egypt from India. By James M'Gregor, M. D. London, 1804, p. 199.

ed in as great a degree to the influence of the state of the mind, as the want of active exercise and good food. It is certain that, in some persons, the melancholy thoughts engendered by confinement operate in this manner, and, with the aid of other causes, may induce the disease.

4. The neglect of cleanliness, and want of adequate shelter and clothing operate in a manner so evident in impairing the circulation of the skin, that they require merely to be mentioned.

5. *Inadequate Nutriment, whether in the quality of the food, or its being monotonous and unvaried. Salt Provisions.*— It was at one time supposed that salt provision was an invariable cause of scurvy, and that scurvy could not take place without it. Two modes were adopted of explaining the influence of this sort of food on the human body. By some, it was said that the salt united with the blood, and destroyed or impaired its nutrient powers; by others, again, it was asserted that the chemical union which took place between the elements of the animal matter and the salt, rendered the former unfit for nourishing the human body. It was further believed that the fat is powerfully productive of scurvy, as it was either rancid, or otherwise much altered in its chemical properties. Neither of these ideas, however, are entirely correct. It is impossible that salt can be united with the blood in any quantity to cause disease. A small proportion of it forms a natural constituent of that fluid; and when it is taken in quantity, it acts as a local irritant, and thus causes its own expulsion from the system. It further appears, that neither do salt provisions invariably give rise to scurvy; nor is its appearance prevented, as we have seen by the use of fresh animal food. Trotter, though abundantly inclined to admit the power of salt meat in inducing scurvy, denies that it is either badly cured, indigestible, or innutritious, (p. 97); and while Sir G. Blane contends that salt beef and biscuit, which have been long kept, contain not much more nourishment than saw-dust or the bark of a tree, he asserts, that, with occasionally a few plantains or yams, and now and then a little rice, he enjoyed the most perfect health; and found others had done the same.

It cannot be denied, however, that bad or scanty fare has some effect in producing the scorbutic state. The influence of such diet in inducing the disease is clearly proved by the ex-

periments of Dr Stark. This ingenious and resolute inquirer, whose life was sacrificed to his scientific zeal, lived for 32 days on bread and water, and afterwards for 29 days on bread and water with sugar, with the effect of forming ulcers on the inside of his mouth, redness, swelling, and bleeding of the gums and nostrils, and finally, purple spots and streaks on various parts of his person. Afterwards, when he had lived for weeks on flour and water with oil of fat or suet, oil of butter, and oil of marrow, the purple swelling of the gums, and the purple spots of the skin returned as before; and it was only after living for four days on bread, stewed beef with gravy, infusion of tea and sugar, and the same time on bread, stewed fat and jelly, with water and salt, that his gums began to get well, and the purple spots of the skin to become paler; and twelve days of ordinary food with the use of wine, that the gums were reported firm and well, and the skin had become natural in colour. (P. 142, 145, 148). About two weeks after this, when he appears to have had no scorbutic symptom, he began a diet of bread or flour with honey, and infusion of tea or rosemary; and on the fifth day after he perceived, for the first time, on the inside of the cheek a small, smarting, ash-coloured ulcer, and three days after, the gums were hot and swelled. At this time the honey diet had proved very diuretic; and two days after, he was attacked with diarrhœa, accompanied with general symptoms of fever. On the 18th February, four days after, he lost nine ounces of blood, the two first portions of which were sily; and after suffering much from pains in the bowels and headach, he died on the 22d, about five days after. The principal phenomena disclosed by dissection were extravasation of blood beneath the pleura and in the cellular texture of the lungs, flaccidity of the heart, and fluidity of the blood contained in it, or that it was of the consistence of syrup; the small intestines red and vascular near the lower end of the ileum, with enlargement of the Peyerian glands; and serous fluid in the ventricles of the brain, and within all the serous membranes to a greater extent than natural.*

No other experiments have been since performed on this subject, unless we refer to this head those of Magendie on the nutrient powers of azotized or unazotized substances; and, so far as they go, they confirm the results obtained by Dr Stark. It ap-

* Works, by J. Carmichael Smyth, M. D. P. 183—190. London, 1788.

pears, indeed, from these, that, whatever be the influence of animal matters, uncombined with vegetable aliment, in inducing disease, even saccharine substances are not entirely blameless, and perhaps the mode in which food of any kind operates injuriously is by its being used too constantly, and without regard to the variety under which the human race, and animals in general, appear to thrive most.

Nothing seems so clearly established in physiology as the necessity of a certain degree of variety in food. Persons fed constantly on animal food without due exercise, and much exposure to the fresh air, become affected with plethora, affection of the stomach, and disorder in the urinary secretion. Those living too exclusively on vegetable diet are also liable to complaints, though of a different character. Even the combination of both, unless often varied, appears hurtful. Though we know not how this unvaried and monotonous mode of living operates, it seems impossible to deny its effects on the human body; and this inference is so much the more positively established, that, as soon as a form of diet, sufficiently varied, is adopted, the disease disappears.

The justice of these inferences is confirmed, I conceive, by the history of the appearance, prevalence, and disappearance of scurvy in the General Penitentiary at Milbank, in 1822. This history may be viewed in the light of an experiment, on the the great scale, to determine the influence of a particular mode of diet and particular modes of living. Though scurvy was not the only disease which appeared there, yet its prevalence was sufficiently established to justify the inference, that it was one of the diseases then prevalent. The circumstances under which it originated deserve particular attention. When the symptoms of scurvy made their first appearance among the inhabitants of this large prison, they were ascribed to the scanty and meagre rate of the diet. But this was rendered very doubtful by the evidence of Sir J. Macgregor, Dr Granville, Dr Johnson, and Mr Bampfield, who stated their belief that the diet was good; and by the fact, that scurvy prevailed after the diet was improved in quantity and quality. The unvaried character of the diet, on the other hand, combined with confinement, inaction, and the cold of the apartments, with the damp air of the situation, evidently had considerable influence on the production of the disorder.

6. Two circumstances in the history of scurvy deserve, in its etiology, particular attention. *First*, it appears to be most clearly established, that scurvy, though lately known mostly as a distemper of maritime origin, prevailed, nevertheless, at one time very much in terrestrial situations. From the testimony of Ettmuller, Willis, Boerhaave, and Sydenham, it results that scurvy was, in the sixteenth and seventeenth centuries, a very common disease in various parts of England; and it appears that it was almost endemial in the humid parts of Somersetshire, Devonshire, and Hampshire. It is remarkable that in the first twenty Bills of Mortality between 1657 and 1677, 60 is the annual average amount of deaths caused by scurvy. After the beginning of the eighteenth century, on the other hand, the annual amount of deaths by this distemper did not exceed 5 or 6; and since the commencement of the nineteenth century, they are much fewer. This reduction shows, in the clearest manner, that its diminution depends on numerous circumstances in the ameliorated state of the condition of the population. Dr Herberden refers the diminution to the same causes which have delivered us from the attacks of dysentery, remittent fever, and plague. (Medical Transactions, Vol. iv. Art. VII. p. 69.)

A second circumstance deserving particular attention is the fact of the disappearance of this disease almost entirely, after 1796, from the British navy. This disappearance also was sudden, and not so gradual as is observed in other disorders. To give some idea of the prevalence of this disease in the British fleet at one period of our naval history, it appears that, in the year 1780, among the total sick sent to Haslar hospital from the Channel fleet, amounting to 8143 persons, 1457 were affected with scurvy. This is between one-fifth and one-sixth of the whole sick. It appears that, during the same year, of 85,000 men voted by Parliament, the amount of sick was 32,121. There is no reason to believe that scurvy was that year less prevalent in more remote stations than it was in the Channel; and, if it prevailed only at the same rate in other seas at which it did in the Channel fleet, at least 5747 seamen must have been ill with scurvy during the year 1780.

It is remarkable, that, though the number of seamen in the navy from 1780 to 1806 inclusive, was every year except two, 1793 and 1794, greater than in 1780, was never under 100,000 men, and was generally from 110,000 to 120,000, yet in no

year was the amount of sick so great as in 1780; and every succeeding year, except in 1795 and 1796, the number of sick was below 20,000; and after the commencement of the present century, they fell to 15,082, to 7600, and to 8000. According to Sir Gilbert Blane, though much of this diminution depends on the abated prevalence of fever, yet a great deal depends on that of scurvy. In the same hospital, viz. Haslar, in which, during 1780, 1457 cases were admitted, only one case was seen during the seven years between 1807 and 1814, and in the Royal Naval Hospital at Plymouth, during the four years between 1806 and 1809 inclusive, only two cases were seen, and which did not terminate fatally.*

This abatement in the prevalence of scurvy has been, in general, ascribed to the practice introduced in 1794, and afterwards more generally in 1796, of distributing citric acid in the form of preserved lemon-juice in certain proportions to the ships' crews. It is certain that, subsequent to the general use of this substance, the disease underwent a speedy diminution, and has since been almost never seen in the crews of the British navy. To this result, nevertheless, accessory causes may have contributed. Thus regulations were issued regarding personal cleanliness, and concerning the proper state of the clothing of the men, and so carefully enforced that the morbid influence of this very powerful cause of sickness was as far as possible annihilated. Great attention was also paid to render the interior of the vessels, and especially the sleeping-places, drier, cleaner, and better ventilated. And, lastly, the victualling department was placed on a much better footing, and conducted so carefully, that whatever influence unwholesome or badly dressed food could have exercised was equally precluded from operating.

But though the disease has been thus eradicated from the navy, it is found occasionally to prevail in vessels of other orders. Thus it has been observed very often during the last twenty years on board the vessels employed to convey convicts to New South Wales; and its occurrence among the passengers, chiefly of these vessels, is another indication of the nature of the causes on which the disease depends. Here are united to the evils of a long-continued voyage, not only great crowding and imperfect ventilation, but sometimes food not

* Select Dissertations, &c. London, 1822. i. p. 40 and 41.

very wholesome, lazy and indolent habits, filth in many instances, mental depression, and all those agents which tend to render the human frame an easy prey to the inroads of disease.

THERAPEUTICS.—The treatment of scurvy consists of two divisions ; the one prophylactic, the other curative.

In the prophylactic management, the great object is to protect bodies of men, as far as may be practicable, from the operation of the predisposing and existing causes. The facts already stated regarding the gradual disappearance of scurvy, not only from the towns of England but from the mariners of its fleets, show the necessity of attending not only to the food, but the clothing, the accommodation, and the other circumstances which contribute to the comfort of the seamen. These it is scarcely requisite to enumerate, as, after the views already given, it would cause repetition. It may be right, nevertheless, to give a summary view of them in the following manner.

1. It is indispensable, in order to guard against attacks of scurvy, to enjoin and enforce particular attention to personal cleanliness, and cleanliness in wearing apparel. The surface should be regularly washed with soap and water ; and frequent changes of clean flannel and clean linen ought to be secured. By these means the energy of the skin is maintained, and the circulation and secretion kept in their healthy state.

2. It is of great moment to insure supplies of fresh and wholesome provisions, both of vegetable and animal matters. The former is of more moment than the latter. The use of tea, coffee, and cacao or chocolate is important, as precluding the use of spirits and excess in fermented liquors. Butter, oil, and fat meat or bacon ought to be either wholly proscribed, or used very sparingly, indeed, as all are more or less injurious in various modes.

3. Citric acid should be distributed at the rate of one or two ounces daily to each person, with or without a little sugar.

4. It is further of very great importance to obtain, as often as may be practicable, supplies of fresh meat, and vegetables, and various fruits. Whenever it is practicable, it is beneficial to obtain such fruits as grapes, oranges, lemons, limes, and shaddocks, or any of those fruits which abound in the citric, in the malic, or the tartaric acids.

5. It is of primary moment to keep a ship's crew or passengers occupied both in mind and body. The former may

not be always practicable, and much depends upon the individuals. But it is in general practicable to enforce more or less occupation and exercise of the corporeal organs, unless the vessel be very crowded indeed. Seamen have in general regular duties allotted to them ; and if these be not enough, they should be subjected to exercise either by the great guns, or the musket, or fencing, and the use of similar exercise. Soldiers and landsmen may be occupied in the same manner.

6. It is of considerable moment farther not to keep the crew or passengers of a vessel too long at sea. In some instances, when the place of destination is distant, the voyage is necessarily long,—as in the case of voyages to Australia and Van Diemen's Land. But whenever it is practicable, the vessel should not be at sea, between port and port, much beyond seven weeks or two months. In general, it was observed in the time of the old voyagers, that scurvy began to appear among a ship's company about the sixth or seventh week after they had entered on sea-diet. There are many situations in which the length of the voyage, the accidental occurrence of calm windless weather, of contrary winds, or boisterous gales, may equally contribute to protract a voyage, and retard the arrival of the vessel at the place of her destination. As it is chiefly under such circumstances that scurvy still makes its appearance on shipboard, next to means being taken to render the voyage not much longer than three or four months, all the other counteracting methods ought to be adopted.

Various other means have been, at different times, suggested and employed as preventives in the prophylactic management of ships' companies during long voyages. Thus Dr Macbride, in 1762, proposed, as a preventive, the infusion of malt or wort, and considerable quantities of this were taken on board his vessels by Captain Cook, and stated to be of use both as a preventive and as an antidote. In subsequent trials, however, with this substance, the expectations entertained of it were not realized ; and we are assured by Sir Gilbert Blane, Dr Trotter, and other physicians and surgeons of the navy, who had good means of obtaining correct information, that, though useful in the early stage of the distemper, and in its milder forms, it could not be invariably relied on, either as a prophylactic or as a therapeutic agent.

Spruce-beer has been also very strongly recommended, and

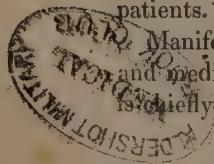
was at one time much used, with the same intention. By possessing some diaphoretic and diuretic properties, it is certainly not altogether contemptible as a prophylactic agent; and it may be used in situations in which the approach of scurvy is apprehended. Upon this alone, however, it would be imprudent and unsafe to place much reliance; and when it is employed, it should only be as an auxiliary to the powerful measures already enumerated.

Sour kraut, or cabbage leaves cut small, fermented and stopped in the second stage of fermentation, was also at one time a favourite prophylactic and antiscorbutic agent with many speculators; and it was first tried in the ships of Captain Cook, and afterwards extensively employed in the British navy, where it is represented to have evinced considerable powers, both in preventing the development of the distemper, and also in curing it after its appearance. During the American war, also, it is represented to have been highly useful to the British troops, when besieged in Boston, in 1775, when they were sustained entirely on salt provisions for many months, and suffered many privations and much sickness from want of fresh vegetable and animal food. At one time, indeed, scurvy broke out, and assumed alarming appearances; but, under the use of sour kraut, a supply of which had arrived, the symptoms were subdued and prevented from proceeding further.

This remedy, nevertheless, has not in subsequent trials answered expectations so well as was expected; and, in short, all of the remedies formerly proposed have given way to the superior efficacy of citric acid in the form of lemon juice, which has long maintained the unequivocal reputation of being something like a specific in the prevention and in the cure of the symptoms of sea-scurvy.

THERAPEUTIC MEASURES.—If, notwithstanding all the means above-mentioned, excepting the use of citric acid, symptoms of scurvy should appear, it is then requisite to employ with promptitude whatever measures may be within reach, in order to stop the progress of the disorder, prevent its propagation, and to alleviate, as far as may be practicable, the sufferings of the patients.

Manifold experience has shown that mere medical treatment and medicines exercise but little influence on this disorder. It is chiefly through the medium of food and drink that any im-



portant or considerable change can be effected in a disease in which the whole mass of the blood is more or less changed. It becomes, therefore, requisite, in the first place, to change the diet of the patient, and to make him subsist, as much as possible, on fresh vegetables and fruits, when they can be obtained.

For this purpose, various vegetable substances have been more or less strongly recommended at different periods; and a number of herbs, supposed or ascertained to possess more or less the property of removing scorbutic symptoms, have been, therefore, designated as antiscorbutic. Of this nature are scurvy-grass (*Cochlearia officinalis*), water-cresses (*Nasturtium officinale*), brooklime (*Veronica Beccabunga*), celandine (*Chelidonium minus*), and several others of similar or kindred orders. The use of lettuce also, celery, and the saccharine vegetables, as carrots, turnips, &c. have been strongly recommended as exercising curative effects. *Lastly*, the use of all the dietetic means, already mentioned as prophylactic, has been equally commended as therapeutic.

All these remedial means, however, have been superseded by the use of lemon juice or citric acid, which, by its uniform efficacy, seems to unite all the desired qualities of a specific antiscorbutic agent. The great success attending the use of this remedy, and the happy changes which have taken place under its use, aided by attention to the dryness and ventilation of the vessels, attention to cleanliness, suitable clothing, and frequent changes of that worn next the skin, with better selected articles of diet, entitle it to the character of a remedy in which the greatest confidence may be reposed.

Though scurvy appears to have been known as a distinct distemper so early as 1555, when Olaus Magnus describes it as peculiar to persons imprisoned, and the inhabitants of besieged towns, it does not appear that we have any earlier notice of the influence of lemon juice in checking its progress and removing its symptoms, than is given by Sir Richard Hawkins, in a voyage to the South Sea, in 1593, whose ship's company was attacked with the distemper, as already stated, when within three or four degrees of the equator.

About forty years after this we find John Woodall, Master of Surgery in London, in 1639, bestowing on it the highest praises, and recommending it as a known and certain remedy,

in the strongest terms, to naval practitioners.* According to the account of Woodall, it was used both as a preservative and as a remedy.

A long period elapsed, nevertheless, before the antiscorbutic virtues of this acid became sufficiently known to admit of its being generally adopted. It was long after Dr Lind had made its properties known, first in 1753, and afterwards in 1772, that it began to acquire the confidence of practitioners; and it was not generally introduced into the navy till 1796. Under its general employment, aided by the auxiliary means already mentioned, the distemper has become, as already stated, nearly extinct in the navy, and when it does appear, it may always be promptly and certainly cured.

The agent in the lemon juice is the citric acid; and any of the fruits containing that acid may be given with equal advantage. These belong to the natural order of the family of *Hesperideæ* of Jussieu; the *Aurantiaceæ* of Correa de Silva and De Candolle; and the fruits most usually employed are not only the lemon (*Citrus Limonum*), but the lime (*Citrus Lima*), the sweet lime (*Citrus Limetta*), the different kinds of orange (*Citrus Aurantium* and *Citrus Bigaradia*), and the shaddock (*Citrus decumana*).

The juice of the most acid of these fruits, as the lemon and lime, is much more efficacious in curing scorbutic symptoms than that of the less acid fruits, as the orange. The juice of the former must be cleared as much as possible from vegetable matter as mucilage, and after the addition of a tenth part of

* "The use of the juice of lemons is a precious medicine and well tried, being sound and good; let it have the chiefe place, for it will deserve it, the use whereof is: It is to be taken each morning, two or three spoonfuls, and fast after it two hours, and if you add one spoonful of *Aquavita* thereto to a cold stomach, it is the better. Also, if you take a little thereof at night it is good to mix therewith some sugar, or to take of the syrup thereof is not amiss. Further note, it is good to be put into each purge you give in that disease. Some chirurgeons also give of this juice daily to the men in health as a preservative, which course is good if they have store; otherwise it were best to keep it for need. I dare not write how good a sauce it is at meat, least the chiefe of the ships waste it in the great cabins to save vinegar. In want whereoff, use the juice of limes, oranges, or citrons, or the pulpe of tamarinds."—A Treatise of Gangræna and Sphacelos: but chiefly for the amputating of any Member in the Mortified Part, according to the long Practice and Experience of John Woodall, Master in Surgery, Surgeon of his Majesty's Hospitale of St Bartholomew, and Surgeon Generale to the East India Company. London, 1693. Sm. folio. Of the Scurvy, p. 161 and 165.

spirits, it may be preserved in well-corked bottles. When attempted to be preserved in the shape of an extract or rob, it undergoes decomposition by exposure to the requisite heat, and its medicinal virtues are destroyed.

In order to remove scorbutic symptoms already developed, lemon or lime juice thus preserved should be given to the extent of from three to six ounces daily, and in very bad cases, it should be given to the amount of a pint daily. Its first physiological effects are in general to induce a loose state of the bowels, amounting to diarrhoea, which is always a favourable circumstance, if it be not attended with pain and followed by increase of weakness. As the diarrhoea proceeds, not only do the hard swellings of the legs and the rigidity of the tendons subside, and the joints become flexible, but the spots also become faint and disappear, the hemorrhagies cease, and the patient begins to recover a little strength. All these changes may ensue in from 12 to 24 hours after the commencement of the diarrhoea. At the same time or speedily after, the skin becomes moist and loses its harsh, rough, dry feeling, and urine is secreted in abundance.

Similar effects, though less speedily, are produced by the liberal use of oranges; and whenever either these or recent lemons can be procured, it is beneficial to administer them in scorbutic cases. From six to eight oranges, or two or three lemons, should be used daily in this manner.

When the use of citric acid is followed by excessive purging with griping and tenesmus, it is proper to add to each dose, from five to ten drops of the solution of muriate of morphia or laudanum.

It is also useful to associate with the lemon juice the use of wine, especially port-wine, which sometimes makes it agree better with the stomach.

From the constipated state of the bowels in the early stage of this disorder, and the beneficial effects of the diarrhoea, whether spontaneous or induced by the use of citric acid, it may be inferred that purgative medicines might be beneficial in the removal of this distemper. It is stated also in the account of the scurvy in Lord Anson's voyage, that the pill or the drop of Mr Ward was administered in the usual dose and manner, at different times, to persons in every stage of the distemper. In one instance it was followed by profuse epistaxis and final recovery. In other cases it produced temporary relief only.

The physiological effects of these medicines were, either gentle diaphoresis, easy vomiting, or moderate purging, all of which were most evident in persons whose strength was not much impaired, but scarcely visible in the enfeebled, and those drawing near to death.

It is probable that moderate relaxation of the bowels, such as merely produces the eccoprotic effect, must be beneficial. For this purpose stewed prunes may be employed, or tamarinds, or a little infusion of senna, may be given occasionally. Dr Henderson prefers sulphate of magnesia in infusion of quassia or gentian.

Diaphoresis is also advantageous, but much depends on the mode in which it is produced. Sir Gilbert Blane is disposed to favour the use of Dover's powder, which many naval surgeons had employed with advantage, with decoction of the woods and plentiful warm dilution. Diaphoresis, however, is not easily produced in this distemper before the bowels have been cleared by the lime juice diarrhœa; and after that has been effected, it ensues spontaneously. The best mode of producing diaphoresis is by the use of the warm bath if it be attainable, or by assiduous washing with cold water and soap, and even by the use of the cold affusion in warm climates. Next to this and along with it, the use of warm clothing, especially flannel next the skin, frequently changed, should not be neglected.

One species of local warm bath, which has been often employed in the treatment of scorbutic patients in warm climates, must not be omitted. It is that of the earth bath, which consists in digging a hole large enough to receive the legs, and covering them all round with loose mould. The patient sits in this for an hour or two, according to his strength and the effects produced; and it is said that this remedy, in a hot climate, is followed by profuse sweating of the parts which had been so immersed in the earth. Sir Gilbert Blane was informed by Mr Stokoe, surgeon of the Vengeance, that he occasionally employed, with advantage, this method of relieving the sufferings of scorbutic patients. It is chiefly indicated when the legs are stiff and swelled, the hamstrings and other tendons contracted, and the patient is lame; (*skelotyrbe*.)

In the case of its being difficult or impossible to procure citric acid in sufficient quantity, or as auxiliaries to its efficacy, other agents have been suggested as remedies for the removal

or alleviation of scorbutic symptoms. Thus in 1795, Mr David Paterson proposed as a very efficacious remedy, both for the prevention of scorbutic symptoms, and for their removal when present, a mixture of vinegar and nitre, in other words, a combination of nitrate and acetate of potass. The therapeutic properties of this agent he stated in terms so strong and unequivocal, that his account of its effects was printed by the commissioners for sick and wounded seamen, and distributed to the surgeons of the navy, where it was tried to some extent. Though several favourable reports of its efficacy were received, others were unsatisfactory. Sir Gilbert Blane regards it as the best remedy merely medicinal next to lemon juice. Vinegar appears to have been used without much benefit by Dr Kirk * and the vinegar and nitre with as little advantage by Dr Henderson.†

In an attack of sea-scurvy among the crew of a private vessel on a homeward bound voyage from Bombay to England, and in which the distemper appeared after heavy rains for ten or twelve days, after being an unusually long time at sea, viz. 101 days, or fourteen weeks and a half, with diminished allowances of food, Dr Kirk found a liberal allowance of coffee, night and morning, to be the most useful remedy. Had it not been for the opportune supply of this article, all on board must have been attacked, and the greater part probably must have perished.

Lastly, Dr Andrew Henderson, who has seen this distemper break out among convicts on their passage to Tasmania and Australia, represents it as the result of his experience, that lemon juice is efficacious, neither as a prophylactic, nor as a therapeutic agent. The failure he observed both in those circumstances in which it was regularly distributed alone in due allowances to the men, and when it was issued along with vinegar and nitre. In 1833, during a voyage unusually protracted, scurvy prevailed with considerable severity and to great extent, notwithstanding the distribution of lemon juice; and he was led then to think of nitre alone. He accordingly tried it, and found it to answer, not only as a prophylactic, but as a remedial agent. Dr Henderson administers this remedy by dissolving from two to four drachms of nitre in six or eight oun-

* Edin. Med. and Surg. Journ. Vol. xxxii. p. 49.

† Ibidem, Vol. lii. p. 11.

ces of water, and giving this solution to each individual in divided doses in the course of the day, sometimes with a drop of oil of peppermint, and occasionally with a teaspoonful of sweet spirits of nitre or gin to each dose.

At the same time Dr Henderson avails himself of the other auxiliaries of warm clothing, stopping the allowance of salt provision, and giving barley, rice, sugar and tea, with wine if deemed requisite.

One advantage presents itself in the use of nitre, viz. that it can always be obtained on shipboard from the gunpowder, by dissolving the latter in warm water and filtering. If half a pound of gunpowder be dissolved in six pounds of warm water, and strained, half a pint of the solution contains four drachms of nitre.

The effects of this remedy thus exhibited are stated to be as follow. The face and complexion assume a more healthy aspect; the strength is increased; the spots disappear; and recovery is completed. It is not stated whether it purges or excites diuresis.

CHAPTER IV.

HEMORRHAGIES OF SOLID ORGANS.

§. I. Apoplexy ; Lethargy. *Encephalæmia. Hæmorrhagia Cerebri, Hoffmann.*

Thomæ Willis de Anima Brutorum, quæ Hominis Vitalis ac Sensitiva est, Excitationes duæ, quarum prior Physiologica, &c. Altera Pathologica, morbos qui Cerebrum et genus Nervosum afficiunt, explicat, &c. Tract. Patholog. Cap. viii. De Apoplexia, et ix. De Paralyti; et passim. Apud Opera Omnia, Amstelædami, 1682. 4to. — Trattato dell' Apoplessia, &c. A Dominico Mistichelli. Romæ, 1709. 4to. — Joh. Jacobi Wepferi, Diversor, S. R. J. Elect et Princip. Archiatri Historiæ Apoplecticorum Observationibus et Scholiis Anatomicis et Medicis Illustratæ. Etiam Aliorum Celeb. Medicorum Observationes Historiæ que Variæ circa Apoplexiam. Amstelædami, 1724. 12mo. Pp. 690. — Joh. Jacobi Wepferi, Diversor, S. R. J. Elector et Archiatri Observationes Medico-Practicæ de Affectionibus Capitis Internis et Externis. Nunc demum publici juris redditæ, Studio et Opera *Nepotum*. B. Wepferi, at G. M. Wepferi, Scaphusii, 1727. 4to. — Hermann Boerhaave, Phil. et Med. D. Prælectiones Academicæ de Morbis Nervorum quas ex Auditorum Manuscriptis collectas edi curavit Jacobus van Eems, Med. Leidensis, Lugduni Bat. 1761. Duo Tomi, 12mo, T. ii. p. 640. — Giovanni Battista Campiani Raggionamenti sopra dell' Apoplessia e i veri Medicamenti, &c. Genua, 1759. — Buchner, Dissert. de causis quibusdam specialibus apoplexiæ observationibus anatomicis rarioribus confirmatis. Halæ, 1764. — Practical Observations on Small-Pox, Apoplexy, and Dropsy. By S. A. Tissot, M.D. &c. Lond. 1772. — Remarks on the Cure of the Epilepsy, to which are added some considerations on the Practice of Bleeding in Apoplexies. By John Fothergill, M.D. &c. Read 21st September 1776. — Medical Observations and Inquiries, Vol. vi. London, 1780. — J. G. Walter, de Morbis Peritonæi et Apoplexia. Berlin, 1782, 4to, et in Memoires de Berlin, 1782, p. 76. — Chandler, Versuch uber die Verschiedenen Theorien und Heilmethoden bey Schlagflüssen und Lahmungen. Stendal, 1787. — Francisci Zuliani, de Apoplexiâ præsertim Nerveâ Commentarius. Brixia, 1789. — Nurnberger, Programmata de Apoplexia causarum morbificarum criteria illustrante et confirmante, Witteberg, 1790. Doering, i. p. 187. — A Commentary on Apoplectic and Paralytic Affections, and on Diseases connected with the subject. By Thomas Kirkland, M.D. London, 1792. — Nurnberger, Dissertatio de vulgari ætiologia apoplexiæ valde ambigua et fallaci. Witteberg, 1795. — Memoires sur la Nature et le Traitement de Plusieurs Maladies. Par A. Portal. Tome i. Paris, 1800, p. 280; and Tome ii. p. 216. — J. L. Ottensee, von der Erkenntniss und Heilung des Schlagflüssen und der Lahmung. Berlin, 1805, 8vo. — Observations sur la Nature et le Traitement de l'Apoplexie, et sur les moyens de le prevenir. Par Antoine Portal, Professeur, un vol. 8vo. Paris, 1811. — Cases of Apoplexy and Lethargy, with Observations upon Comatose Diseases. By J. Cheyne, M.D. &c. Lond. 1812. 8vo. Pp. 224. — Recherches sur l'Apoplexie. Par M. Rochoux, D.M. Paris, 1814. 8vo. — Nouvelle Division des Apoplexies. Par A. Serres. Annuaire Medico-Chirurgicale. Paris, 1819. 4to, p. 246. — A Treatise on Nervous Diseases. By John Cooke, M.D. &c. in two volumes, Vol. i. on Apoplexy. London, 1820. — De L'influence de l'Estomac sur la production de l'Apoplexie. Par J. Richond, D.M. Paris, 1824. 8vo. — Pathological and Practical Researches on Diseases of the Brain and the Spi-

nal Chord. By John Abercrombie, M. D. &c. 1st Edition, Edin. 1827. 2d Edition, Edin. 1829. — Hospital Reports. By Richard Bright, M.D. &c. London, 1831. Vol. ii.

THE definition of apoplexy which Cullen derived from its symptoms is correct; and the view of its pathology which he delivered was, upon the whole, just, so far as he ascribed its symptoms to compression of the origin of the nerves or medullary portion of the brain, (1103.) But by attempting to refer to the same head affections entirely different, if he did not confuse its pathology, he at least rendered it erroneous, and failed completely in giving a satisfactory account of the diseases so treated. Thus he regards as apoplexy, not only that state of the vessels which he supposes to induce compression of the brain, but the symptoms resulting from suspended animation, by the non-respirable or irritating gases, hanging, drowning, &c.; those arising from an overdose of the narcotic medicines, as opium, belladonna, &c. and those arising from the sedative operations of cold, electricity, &c. Though this practice has received some sanction from the recent example of Dr Cooke, it is at variance with the best experiments and researches of modern times, which clearly show that there are good grounds for drawing a line of distinction between apoplexy on the one hand, and *asphyxia* and narcotism on the other; and that the characters of the former disease should be derived, not only from symptoms and the order of their succession, but from that state of the organs on which these symptoms depend. I introduce the consideration of it in this place, because I think it established by the facts adduced in the Elements of Pathological Anatomy, that its symptoms depend in all cases, either on that state of the vessels of the brain which precedes hemorrhage, or on effusion of blood, which has already taken place.

The name of apoplexy is given to that assemblage of symptoms in which the whole of the external and internal senses, and the whole of the voluntary motions, undergo, either a temporary suspension, or more or less complete abolition, while respiration and the action of the heart continue to be performed. According as the senses appear more or less directly affected, the disease has been denominated lethargy, *carus*, and *coma*;* and, according to the mode of its attack, it has been termed cataphora (*descensus*), apoplexy, or *sideratio*. But all

* Heberden, "Debilis sensuum animique prout major sit, vel levior, dicitur carus, coma, aut lethargus." 286.

these ought to be understood as denoting mere varieties or shades of difference.

The disease may come on suddenly or slowly. A person apparently in good health falls down without sense and motion, and continues for some time in what is popularly termed a fit. If he be examined at this time, he is found to be more or less insensible to sounds and other external impressions; and the usual efforts to rouse him are unavailing; he is speechless, or utters inarticulate groans; and he has lost the use of his limbs, which lie motionless and relaxed. His pulse, however, is found to beat, but much more slowly, generally, than natural; and his respiration, which is generally languid and interrupted, is not unfrequently accompanied with a peculiar noise, termed *stertor*. This has been said to be a mark of the most violent state; and perhaps in most severe and fatal cases it appears sooner or later; but it is not invariably present in the most complete form of the disease; and well-marked and violent instances of apoplexy may occur without any stertorous breathing. This is the ordinary form of the apoplectic fit or seizure.

Though the symptoms now described may come on suddenly, yet they are in many cases preceded by various complaints about the head and the organs of sight and hearing, which may justly be regarded as announcing the probable approach of an actual fit of apoplexy. Thus, if a person has frequent fits of giddiness, frequent headaches, some transitory interruptions of sight and hearing, or occasional false vision and hearing, as spectral hallucinations, frequent ringing in the ears, it will be reasonable to suppose that the circulation within the head is not in a healthy state. If to these symptoms are conjoined thickness or indistinctness of speech, or faltering in a person whose speech previously was articulate, transitory numbness or loss of motion in the extremities; or if he complain of frequent fits of nightmare (*incubus*;) seems often drowsy, or betrays an unusual loss of memory, then it may be presumed that an actual fit is not very remote, and may appear on the first application of any exciting cause. It not unfrequently happens that in a person with such complaints, hemorrhage from the nose, more or less abundant, and more or less frequent, takes place at intervals to their great relief. Such an occurrence will add another to the circumstances above mentioned to guide the physician in his opinion. The extent to which these nasal hemorrhagies some-

times proceed, is extraordinary. Several pounds of blood will be lost before it shows any tendency to cease.

The duration of the apoplectic paroxysm varies from eight to forty-eight hours, or even three days. It rarely destroys life in less than one or two hours; according to Rochoux, before three or four hours; and most sudden deaths in which the fatal event takes place before this time, arise from affections of the heart, rupture of an aneurism, or some other internal hemorrhage. When the termination is not immediately fatal, the patient gradually recovers some degree of sight and hearing, and manifests consciousness of surrounding objects and persons. Speech is rarely recovered entirely, either at first or eventually. But the countenance is distorted, the speech indistinct, or perhaps gone, and the limbs are more or less affected with palsy. One side of the person is entirely motionless (*hemiplegia*); and the other has but imperfect power, or is more or less convulsed. After the first attack, it manifests a tendency to return, and sooner or later these attacks may prove fatal.

Cullen ascribed the symptoms of apoplexy to interruption of the motions of the nervous power, *either in consequence of compression of the origin of the nerves, or of something destroying the mobility of the nervous power*. This language is hypothetical, in so far as it is not ascertained whether the nervous power, if its existence be admitted, is susceptible of motion. And it has been since ascertained, that the states of the animal body, which Cullen considered as examples of the immobility of the nervous power, depend chiefly on interruption of the functions of respiration, and the corresponding conversion of venous into arterial blood. The grounds of the notion of compression are also called in question by those who assert that the brain is incompressible. This, however, is a mere verbal distinction; and, without stopping to inquire into its propriety, I proceed to state what is known on the pathology of apoplexy.

Anatomical inspection shows that the brain is not only largely and abundantly but very freely supplied with blood. Four large arteries, which unite in the interior of the scull, convey, it has been calculated, one-sixth of the whole blood of the system to the brain and its membranes. It is true that this blood is returned with equal facility in the healthy state, by the arrangement of the veins; but it will subsequently appear that

a good deal depends on the copious and free supply of blood which the brain receives.

I have already spoken of the hemorrhagic effusions which have been known to take place from the cerebral membranes; and I have shown that, if blood is found either on the convoluted surface, or within the ventricles of the brain, it proceeds from the arachnoid membrane, assuming the hemorrhagic action. One of the great uses of the *pia mater* or vascular membrane is to support and convey, as it were, the small arteries into the substance of the brain. Not a single artery, however minute, enters this organ without previously passing through the *pia mater*; and, if the carotid and vertebral arteries are injected, the cerebral matter may be washed away entirely; while all the vessels by which it was traversed will be found issuing from the attached surface of this membrane and its numerous processes. The vessels thus demonstrated consist of minute arteries and veins, through which, in the healthy state, the blood moves easily and uniformly without remaining any undue time, or undergoing any retardation. Dissection, however, shows that, from causes to be afterwards specified, either the whole or a certain order of these vessels may become unusually filled and distended with blood; while others, which in consequence of conveying colourless fluid previously escaped observation, now becoming loaded with red blood, are rendered visible. The existence of this state is proved by inspection, and by cutting the brains of those who have been cut off at this early period of the disease, into thin slices, when numerous blood drops follow each incision, and each part is penetrated by a much greater number of vessels than natural.

This state of the cerebral vessels is similar to that of inflammation. The patient is highly sensible to transitions of heat or cold, and occasionally shivers; the skin is hot and dry; the tongue foul, and the stomach disordered; in some cases sickness ensues, and terminates in vomiting; and the urine is high-coloured and sedimentous. The pulse also is full and strong, sometimes hard, but not frequent; and if blood be drawn it exhibits a thick and tough buffy coat. The local complaints are, dull pain and weight of the head, occasional giddiness, indistinctness of vision, or dazzling of the eyes, and more or less loss of memory. In some instances, the patient, after shivering, falls into a state of heavy oppressive sleep, which, however,

is neither sound nor refreshing ; from this he can be roused for a little, and speaks intelligibly, but again falls back into the same heavy somnolent condition, and continues in it for 24 or 30 hours, with flushed face, heavy labouring pulse, considerable heat of the surface, and diminished sensibility to external impressions. In some instances, this subsides under the use of purgative medicine and low diet, with rest ; but in others, it proceeds to a more serious state.

The duration of this condition of vascular distension varies according to the circumstances and mode of living observed by the patient. If it do not subside spontaneously, or, in consequence of a nasal hemorrhage or other evacuation, or a more temperate mode of life, the vessels of some part of the brain become more thoroughly injected, and a complete fit of loss of sensation and motion is the immediate consequence. It has been thought that this could not happen unless blood was effused ; but various instances of complete apoplexy have occurred to competent observers, in which the cerebral vessels were loaded only, and in which effusion had not yet taken place. It is further probable that the instances, in which people recover from complete apoplectic seizure, without suffering palsy, take place from vascular injection only. The possibility of blood accumulating in the cerebral vessels, and distending them to such a degree as to cause apoplexy, was admitted by Morgagni and Cullen (1103) ; and the observation is confirmed by Baillie, without being aware that it had been made ; and by Rochoux, who, however, thinks it is not an invariable result. I observe, nevertheless, that M. Rochoux forgets that the cases in which it occurs, are not so frequently the subject of inspection as the cases of actual hemorrhage ; for they are less frequently fatal than the latter.

Hemorrhage, however, does take place. Blood escapes from the distended vessels, though whether by exhalation or by actual rupture is not agreed ; and, forcing its way among the nervous matter of the brain, separates it, breaks it down, and forms a sort of hollow or cavern, in which it coagulates. If the quantity be considerable, if it be effused suddenly, and in certain parts of the brain, (annular protuberance, &c.) if active remedies be not used, or if, when used, they are ineffectual, complete coma very soon terminates in death, and, on dissection, more or less blood is found in some part of the substance of the brain. When, on the other hand, the effusion is not co-

pious, nor takes place suddenly, or in a vital part of the brain, or if, by the use of proper remedies, the discharge or its effects are counteracted, then further changes take place and go on, until the natural structure of the brain is so much altered that life can no longer be continued. The effused blood, after coagulating, acts as a foreign body, breaks down, softens, and disorganizes the part with which it is in contact. After some time even the coloured clot begins to change, and is removed more or less perfectly;* while the part in which it had been effused, and which it had converted into a hollow, is filled with serous fluid, and softened or pulpy cerebral matter.† In this manner are formed the cavernous sacs described by Wepfer and Morgagni, and the caverns described by Baillie, (p. 455), which are found filled with serous fluid. It is the presence of this fluid in such situations which has given rise to the notion of serous apoplexy. Serous fluid also may be exhaled from the extremities of the distended arteries; but Portal shows satisfactorily that it invariably arises from the same state of the vessels as the hemorrhage. In short, if from any cause the circulation within the head becomes unusually slow, and the vessels of the brain become unnaturally distended, one of two effects will take place, as in other situations. Either red blood is poured out from the extremities of the arteries, or serous fluid is exhaled in undue quantity, and to greater extent than can be removed by the veins. It is the latter process in all probability that takes place in the slow and gradual drowsiness and stupefaction which distinguish the form of the disease termed Lethargy. (Willan's Reports, p. 338, for 1799, November and December.)

This change in the structure and consistence of the brain is one variety of softening or pulpy disorganization; and, notwithstanding the opinion expressed by Pariset, Recamier, Rochoux, and other authors, that it is the cause, it is invariably

* "The appearance of the effused blood differs according to the duration of its effusion. When death supervenes quickly, at the end of three or four days for example, it is blackish, in soft clots. After a month or six weeks, it becomes firm, assumes a deep-brown colour, and resembles the blood of aneurismal tumours. At a more remote period, it becomes still more compact, and of a pale-red colour, bordering on ochreous yellow. Lastly, it is entirely absorbed, as is proved by our dissections."—Rochoux, p. 86.

† "The extravasated blood would seem, in such cases, to have been dissolved and taken up by absorption; but the injury is not repaired, and a cavity remains afterwards filled with serous fluid."—Baillie, 450.

the effect of the effusion. This inference is established; not only by the facts already mentioned, but by the cases of Morgagni, M. Dan de la Vauterie, Lermnier, Serres, and those of Lallemand. It may be termed hemorrhagic softening of the brain.

Though vascular injection, with or without bloody effusion, may take place in any part of the brain, certain parts are much more commonly the seat of the discharge than others. Willis first showed that, in cases of apoplexy with lateral palsy, or *hemiplegia*, blood is effused, and forms caverns or dark-red softened spots, most usually in the *corpora striata*.* This conclusion was adopted by Bonetus and Morgagni, who extended it by observing that, besides the *corpora striata*, the optic *thalamus* were liable to be affected, or both might at once be the seat of extravasation, while the anterior part of the hemisphere was very rarely, and the posterior part almost never, affected. I have, in the Elements of Morbid Anatomy, given such numerical statements of the recorded facts as are calculated to illustrate, if not to determine, this question. It may be stated, in general, that the part most usually the seat either of vascular injection or hemorrhage is the *corpus striatum*, next to that the optic *thalamus*, then the hemispheres, then the annular protuberance (*pons Varolii*,) then the *crura* of the brain, the spinal bulb (*medulla oblongata*,) and the cerebellum in the order now enumerated.

Hemorrhagic injection, or hemorrhage in the different regions of the brain, exercises on the functions of sensation, locomotion, speech, respiration, digestion, memory, and judgment a certain influence, and causes various changes, which I must endeavour to state as briefly as possible in the following manner.

When an apoplectic seizure terminates in lateral palsy, the apoplectic symptoms disappearing, and leaving hemiplegia of one side, it is inferred that effusion has taken place in the *corpus striatum* of the side of the brain opposite to that in which the side has lost its power. When the paralytic symptoms affect the lower and upper extremities at once, the injection and effusion are seated in the *corpus striatum* and the optic *thalamus*.

When the lower extremity of one side only is paralytic af-

* Cerebri Anatome, Cap. xiii. De Anima Brutorum, Pars Patholog. Cap. ix.

ter an apoplectic seizure, the injection or effusion has taken place chiefly in the *corpus striatum* of the opposite side.

When apoplectic symptoms continue without recession or abatement, in general effusion to a considerable extent has taken place in the *corpus striatum* and hemispheres, and also there is much general injection of the whole base of the brain.

When apoplectic symptoms are associated with stertor, loss of speech, and general resolution of all the muscles, there is either general injection of the whole brain, with great injection near its base, or there is effusion of blood in both sides.

When to the symptoms now specified there is added slow and laborious respiration, or rapid, but irregular and imperfect respiration, and the anterior part of the lungs is emphysematous, the *crura* of the brain or the annular protuberance are the seat either of hemorrhagic injection or effusion.

When apoplectic symptoms recede, but leave loss of speech, or inarticulate speech and hemiplegia, there is, or has been, injection or slight extravasation about the *crura* or the protuberance, or the spinal bulb.

The memory is often altogether or partially lost after an apoplectic attack. The individual loses the power of expressing himself in his own language, but speaks, though incoherently, in various foreign languages, if he have known them; and if not, in a confused and unintelligible jargon. In this case, various parts may have been affected; but in general there is more decided affection of the anterior and middle lobes of the hemispheres than of other parts of the brain.

Lastly, when memory and judgment are impaired, most generally the lesion depends on the general injection of all the meningeal and cerebral vessels, a greater degree of fulness than they can well bear, constantly maintained, and very frequently osseous rigidity of the cerebral arteries.

ETIOLOGY.—The causes which give rise to apoplectic congestion of the brain are of two kinds, predisponent and exciting.

The predisponent causes are those which, being already in the system, contribute to derange either the circulation in general, or that of the head in particular. Of this first description are diseases of the heart or its valves, such as ossification or contraction of the auriculo-ventricular orifice, of the aortic valves, of the aorta itself, and in some instances of the *vena cava*, diseases of the liver, as tubercular disorganization, &c.

and some diseases of the lungs. To the second head belong, tumours or new growths in the brain, ossification, or other induration of its membranes, and especially ossific or steatomatous degeneration of the arteries of the brain. The coats of the internal carotid and basilar arteries, especially, are very frequently found in this state in apoplectic subjects. In consequence of this deposition, they become less contractile, less distensible, less tenacious, and perhaps more brittle; and whenever blood is accumulated in unusual quantities in the brain, as they do not readily admit of distension, rupture is the consequence. (Baillie, 453.) The influence of this state of the cerebral arteries has been carried to a length still greater in accounting for the occurrence of apoplectic attacks by M. Bouillaud. This author adduces a number of cases of cerebral hemorrhage causing sudden and well-marked apoplectic symptoms, to establish the inference, that apoplexy is a disease of the vascular system of the brain, rather than of the organ itself; and that this disease consists in chronic inflammation of the arteries causing steatomatous or osteatomatous deposition, and rendering them unfit for their functions, as elastic and transmissible tubes. His notion, indeed, is, that cerebral hemorrhage arises from a state of the cerebral arteries, the same as that which causes aneurism in other regions of the body.

These several causes, however, are predisponent only. A fit of apoplexy may occur and prove fatal in persons in whom neither the arteries of the brain are ossified, nor are tumours found, nor any other state except mere vascular injection. And, on the other hand, the cerebral arteries may be ossified, or steatomatous, in many persons who have never had a single fit of apoplexy.

Old age has generally been regarded as a predisponent cause of apoplexy; and it is attended with two circumstances, which are not altogether without reason regarded as of considerable moment. The first of these is the tendency, already noticed, which the arterial system, more especially, betrays to become diseased after the meridian of life. The second is the venous plethora, so ingeniously maintained by Cullen. The proofs of the existence of venous plethora, and the theory of its operation, may be found in Cullen, who misunderstood its nature, and overrated its influence. There is little doubt that the circulation in the veins, either in consequence of diminished pressure and tension of the skin and other coverings, or in-

creased laxity of the venous tunics themselves, or increased resistance at their connection with the heart, does not go on with the same perfection and facility with which it does in early life. But whether there is a greater venous plethora in the head at that period than before or not, seems doubtful. There is reason to believe that the fulness resides as much in the arteries as in the veins.

The symptoms which Cullen ascribed to venous plethora are most frequently dependent on the presence of different forms of disease of the heart or arteries. It is found, for instance, that in most cases of apoplectic seizure, either the left ventricle of the heart is affected with hypertrophy or dilatation, or the mitral valve is ossified, and its aperture contracted; or the aortic valves are more or less diseased; or even the whole of the arch and part of the descending aorta may be ossified, roughened internally, and incapable of transmitting the blood properly. These various states of the heart will be quite sufficient to give rise to the symptoms of venous plethora, and are assuredly the true cause of that state. They tend to impede the circulation, and thereby to derange the equable distribution of blood throughout the system.

Another morbid state, manifestly giving rise to the symptoms of venous plethora in the apoplectic, are various disorders of the lungs. In inspecting the bodies of persons destroyed by apoplectic symptoms, portions of the lung are occasionally found solid, uncrepitating, and indurated, and sometimes blood, or serous fluid, or sero-sanguine fluid is contained within the cavity of one or both *pleuræ*. (Portal.) The bronchial tubes are filled also with puriform and bloody muco-purulent fluid. In such subjects it is found, on inquiry, that the individuals have for some time laboured under cough, difficult breathing, and occasional orthopnoea, with expectoration of puriform matter and mucus.

In point of fact, cases of apoplexy occur at all ages, but are most frequent between the fiftieth and the sixty-fifth or seventieth year. From comparing the ages of the subjects of a considerable number of cases, it results that apoplexy is a rare disease before the thirtieth year; from that period to the fiftieth, it is not common but may occur; after fifty it becomes more common; between sixty and seventy it is frequent; becomes of the same rate of frequency after seventy as before eighty, and is very rare after the eightieth year. In general,

when the disease takes place before the thirtieth year, it is the effect either of organic disease of the brain or of disease of the heart, especially ossification of the mitral valve, and arctation of its aperture, or hypertrophy of the left ventricle.

The mode of living has an undoubted effect. Habits of intemperance and debauchery induce not only a plethoric, but an irregular state of the circulation. That part of it, especially, which is concerned in secretion and excretion is deranged; and these functions undergo proportional disorder. In some instances, the long and habitual use of spirituous or vinous liquors can be shown to have induced apoplexy, by operating either on the arterial system, or by inducing disease of the liver. Under this head also may be noticed the liability of gouty persons to apoplexy. It has been formerly shown, that there is no proof of a specific matter in gout; and there is reason to believe that the occurrence of apoplexy in gouty subjects depends chiefly on the fulness of the vascular system which is invariably observed in such subjects.

Another predisponent cause referable to this head consists in various morbid states of the stomach. When this organ is disordered, especially in its circulation and secretions, its morbid condition seldom continues long without producing an effect more or less considerable, upon the circulation of the brain. It is known that this sympathetic influence is going on by pains, more or less constant and severe, in the head, by the patient often complaining of giddiness, or some disorder in the sight, as intolerance of light, followed by diminution of vision, some disorder in hearing, as tingling in the ears, sense of ringing within the head, and occasional confusion of memory or thought. It is commonly thought that this sympathetic action indicates affection of the membranes only. But it either indicates at the same time affection of the brain, or shows that the disorder of the membranes is passing to the substance of the brain.

A peculiar physical conformation, as a short neck, a large head, and corpulent figure, has been supposed to favour the formation of apoplexy. Though it certainly does, the disease is not confined to this mode of structure; for it has been observed to take place in persons of lean and slender figure, with a long neck. It is not unfrequently remarked to take place in persons labouring under frequent and copious hemorrhoidal discharge, in women who have had copious menstruation, and in both

sexes who have been liable to eruptions of the skin, periodical diarrhœa, or the like.

The exciting causes are those which, upon occasional or temporary application in those otherwise disposed, may induce the disease. Of this kind are,

1. Stooping, or placing the head in a depending position, whereby the gravity of the blood increases its afflux by the arteries, and impedes its return by the veins.

2. A tight ligature, as a neckcloth, &c. about the neck, which compresses the veins more than the arteries.

3. Great muscular efforts, during which, in consequence of shutting the glottis and fixing the chest, to enable the muscles to act with greater power, the motion of the venous blood, especially from the head to the heart, is more or less obstructed.

3. A surfeit or extraordinary debauch, in which not only the quantity of food and drink acts mechanically by compressing the aorta and other vessels, but the unusual and excessive excitement given to the stomach, causes a remarkable derangement in the circulation of the brain.

5. Extremes of cold or heat. Apoplexy has been observed to follow occasionally the use of the warm bath, or the excitement resulting from a crowded assembly, and sometimes the solar rays in hot weather, directed upon the head. Cullen remarks, that its attacks are most frequent in the spring, especially when the vernal heat suddenly succeeds to the cold of winter. According to Rochoux, however, season is almost, if not entirely, a matter of indifference, the number of apoplectic cases in spring, winter, and summer, being nearly equal, and that in autumn being one-sixth more than in spring.

6. Mental emotions and passions. Surprise, joy, extreme grief, alarm or panic, a violent fit of anger,—all have been known to bring on an apoplectic seizure in those predisposed.

7. Pregnancy and parturition may also operate as exciting causes. If the first is to be regarded as predisponent, the second must undoubtedly be admitted to be exciting. The first is undoubted; and the theory of their operation is clear to those who remember the influence on the circulation which pregnancy and parturition exert. On this subject Portal may be consulted with advantage. Art. xiv.

The several events of apoplexy in health, death, or other distempers, as palsy, &c. may be foreseen from considering

the predisponent circumstances and the antecedent symptoms, the exciting causes and their influence, the violence and degree of the symptoms which have taken place, their duration, and the effect of remedies employed.

Apoplexy may terminate, 1st, in resolution or recovery ; 2d, in palsy, more or less complete ; 3d, in death.

1. Under the prompt use of active remedies, apoplectic symptoms may entirely subside ; the patient recovers recollection and sense ; the pulse first becomes less frequent and softer, then a little more frequent, and then falls to the natural standard ; the skin becomes moist ; and, perhaps, a slight attack of piles comes on. It is probable that this is the case of simple inflammatory apoplexy without effusion.

2. A very common termination of an apoplectic attack, when recovery is partial, is palsy, most usually *hemiplegia*. In this case, effusion has usually taken place in the *corpus striatum*, or the optic *thalamus*, or both, and the structure of these parts is more or less extensively destroyed. In other instances, apoplexy terminates in amaurosis, paralytic dropping of the eyelids or side of the face, or angle of the mouth, loss of memory, or loss of judgment.

3. *Lastly*, it may terminate fatally. This it rarely does immediately, seldom before 12 or 24 hours. In such circumstances, the patient lies in a state of deep somnolent stupor or coma, with every muscle relaxed, and sometimes with slight spasmodic twitches of one side, breathing slowly at first, and stertorously, afterwards more rapidly, always with labour and inefficiency. At length, respiration becomes rapid and rattling ; and death ensues.

THERAPEUTICS.—The treatment of apoplexy consists either of the means of prevention or the means of cure.

It appears from the account above given, that apoplexy, on many occasions, gives some warning of its approach ; and this is always to be obviated by avoiding the remote and exciting causes, or preventing their operation as far as may be possible. But pathology shows that there is a peculiar state of the system, which it must be the great object, not only of the practitioner, but of the patient, to obviate by every means ; and this is the plethoric state of the sanguiferous system in general, and the overloaded state of the vessels of the brain in particular.

This may be affected in various ways, but most certainly by judicious management of exercise and diet.

The principal use of exercise in obviating morbid fulness, is to maintain the regular and effective action of the skin, the kidneys, and the bowels. It is injurious to hurry respiration or increase heat ; and it has been therefore recommended, that gestation, and especially riding on horseback, is to be adopted rather than walking. As walking, however, may be taken in all possible degrees, and as it is, without doubt, the most effective, there is no good reason for proscribing it entirely. It should be avoided in hot weather, and it should never either be continued so long as to fatigue, or carried to such an extreme as to overheat. Taken with such restrictions, it will be found more effectual than either sailing, riding, or any other gestatory exercise, in restraining corpulence, and obviating plethora.

In persons who early in life show the predisposition to apoplexy, it is probable that low diet, with much exercise, might entirely prevent the approach of the disease. But in those who are advanced in life before they think of taking precautions, and are also corpulent, which generally implies the habit of full living, an opposite mode is supposed not to be entirely safe. There is reason to think that these fears are groundless, or at least greater than is necessary. It is, at all events, certain, that in persons accustomed to full living, a much greater diminution can be borne than is generally supposed, and it produces a much more marked effect than in others not so accustomed. Thus, in corpulent persons, with apoplectic tendency, supper should be entirely relinquished ; animal food should be greatly diminished at dinner ; and the diet should consist chiefly of bread or its preparations, of the farinaceous seeds, light soups, eggs, the less flatulent vegetables, and milk.

The same prejudice which dreads low diet, views with suspicion the absolute relinquishment of spirituous or fermented liquors. Now, it is certain that, even in those accustomed to the excitement of these unnatural stimulants, the substitution of the weaker liquors is not only not injurious, but beneficial ; and if nothing but water be taken, none of the results so much dreaded are observed. Cullen thought that plain water was liable to occasion costiveness ; this it might have done in some instances which fell under his observation ; but in the greater

number of instances it has as little effect in this way as small-beer. There can be, on the whole, no hesitation in proscribing entirely wine, malt liquor, and spirituous mixtures to those of apoplectic tendency. The use of tobacco and all narcotic stimulants should be immediately abandoned.

In general, by proper management of diet, with the aid of seasonable and regular exercise, not only the skin and kidneys, but the bowels, will perform their functions properly. If they do not, an occasional laxative should be employed; and either the aloetic pill or the aromatic infusion of senna will be found useful. Antimonial wine in small doses is also a useful adjuvant; and it is sometimes advantageous to administer daily a pill consisting of one grain of ipecacuan and two of rhubarb.

When, notwithstanding the use of the above means, symptoms appear which threaten an attack of apoplexy, blood-letting is the most certain and efficient remedy. It has been supposed of moment to take it from vessels as near the head as possible; and incision of the temporal artery or jugular vein has been recommended. It is, however, of little consequence whether it be taken from these vessels or from the arm. The object is to diminish the quantity contained in the vessels of the brain; and this, we know, can be done as easily and certainly by drawing it from the arm as from the vessels of the head. In doubtful cases, leeches applied to the temples, or scarifying and cupping the hind-head and nape of the neck, may be employed with benefit. Under the same circumstances the hair should be removed, and a seton or issue may be established near the head.

These means will generally be successful in preventing an attack, providing sufficient care be taken to avoid exciting causes. When, in consequence of neglecting those precautions, a fit has actually happened, the rapid progress, violence, and fatality of the disease demand the most prompt and energetic application of proper remedies. These are, blood-letting, general and local; removal of the hair, and the application of cold to the head; purging; blisters; a cool apartment, and low diet.

In the *first* place, it is requisite to keep the patient as much as possible in an erect posture, or, at least, with the head raised, the most effectual mode of doing which is by raising the upper end of the bed, so as to render it an inclined plane. The apartment should be large, airy, and cool; the bed-clothes few; and none but the necessary attendants admitted.

Blood-letting is the most powerful means of controlling hemorrhage, and removing the congestion on which it depends. It may be carried in all cases to at least 20 ounces, and, unless decided relief results from this, it may be pushed to the extent of 30 or even 35. It may then be desirable to try the co-operating influence of local depletion by leeches and other remedies. After this a second blood-letting of 30 ounces, or a third of 20 may be often requisite.

Of auxiliary remedies, the most powerful and immediate in its effects is the application of cold. The hair should be removed, and cloths moistened with cold water applied to the shaved scalp. Ice is rarely necessary; it may sometimes be advantageous to ice the water; but the most important point is to repeat the application of the cold water as soon as it becomes sensibly warm.

The next remedy is to evacuate as speedily as possible the intestinal canal. If the power of swallowing remain, or be restored by the blood-letting, a full dose of calomel and jalap, or the compound powder of jalap, should be immediately given, and followed by the aromatic infusion of senna, or an ounce and a half of castor oil. If the patient is unable to swallow, the purgative glyster should be administered without delay, and repeated if requisite.

Blisters are recommended in the treatment of the apoplectic fit; but they are not very convenient remedies. Admitting the certainty of their effect, their operation is too slow, and if applied to the head, where alone they can be useful, they deprive the practitioner of the benefit of the more powerful remedy of cold water. It is chiefly after the urgent symptoms have abated or disappeared that they seem to be most useful.

On the effects of emetics, various opinions have been entertained. By Cullen and others, the action of vomiting has been supposed likely to impel the blood to the head. This seems a hypothetical fear. But, at all events, no doubt can be entertained of the merit of nauseating doses, which may be attempted by means of antimonial wine, or the antimonial solution, after the severest symptoms have been controlled by blood-letting.

For the treatment of apoplexy terminating in palsy, the next chapter may be consulted.

§. II. Palsy; Paralysis. *Hemiplegia. Paralysis Partialis.*

(See the Works mentioned in §. I.)

Cornelii Pereboom Med. Doc. &c. Dissertatio de Paralyysi imprimis Nervæ Hornæ, 1773.—In Thesauro Pathologico-Therapeutico, Jo. Christ. Trans. Schlegel. Vol. i. Part I. Lipsiæ, 1789, p. 243.

PALSY consists in the loss or temporary suspension of the power of voluntary motion, but without alteration in the structure of the muscles. This definition excludes, therefore, all those instances of immobility of the limbs which depend on affection of the muscles, aponeuroses, or tendons, as in rheumatism and gout, and in adhesive inflammation. Whether it ought to exclude also that which follows the poison of lead, can be determined only by ascertaining whether this poison acts on the nerves or on the muscles; but it is certain that, by arranging lead-palsy with genuine palsy, Cullen derived no advantage in explaining its pathology or delivering the best treatment. Genuine palsy depends, it will appear, in all instances, on disease either of the brain, or of one or more of the nerves.

The forms which palsy assumes may be referred to three, *hemiplegia*, or lateral palsy, *paraplegia*, or transverse palsy, and local or partial palsy. In the first, the whole of the muscles on one side of the body lose more or less of their power of voluntary motions. In the second, the muscles of the lower half of the person, sometimes from the shoulders downward, sometimes from the loins, sometimes only the lower extremities, are deprived of power. In the third form, the loss of power is confined to a single muscle, or a set of muscles.

I. Of these, the lateral palsy, or *hemiplegia*, is the most frequent, and it is most conveniently introduced in this place, because it depends on a lower degree of the same morbid state which takes place in apoplexy. It usually begins with, or follows a fit of apoplexy,* and when, after continuing some time, it becomes fatal, it is in general by passing again into apoplexy. When it comes on more slowly, it is preceded by the same symptoms which precede the apoplectic attack; and when it appears, it is often attended with some temporary loss or suspension of sensation, some confusion of the head, wandering of the ideas, loss of me-

* Resolutio membri unius vel corporis dimidii, sæpe incipit ab apoplexia, sive subita virium et sensuum extinctione, quæ perseveravit modo horas multas, modo exiguum horæ partem. Multo tamen sæpius hic morbus sensim obrepit usque eo ut ægrotus subito conciderit motu et sensibus destitutus.—Heberden, cap. 69, p. 288.

mory, indistinctness of speech, and other marks of impaired dominion of the will over the muscles. At length the features on one side of the face are distorted; the tongue if pushed out is thrust to one side; the arm cannot be raised from the side, nor the leg made to move unless by a dragging imperfect motion, and the half of the person is more or less completely immoveable. The opposite side in severe cases is convulsed.

These symptoms depend on a slighter degree of the same morbid state which gives rise to apoplexy. Accumulation of blood in the vessels of a part, where it does not abolish sense, for example, in the hemispheres, or the striated body, pulpy destruction, effusion of blood within the hemispheres, terminating in pulpy destruction, effusion of serous fluid, effusion of blood in the ventricles causing pulpy destruction, indurated portions or tumours of the brain, the chronic inflammation, resulting from wounds of the hemispheres, all have been found to give rise to hemiplegy. In general, the morbid change is on that side of the brain which is opposite to that in which the muscles have lost their power of voluntary motion. Some facts lead to the inference, that if it take place on the same side the *cerebellum* is the seat of lesion.

II. The transverse palsy (*paraplegia*) is of two kinds, one depending on affection of the brain, the other on affection of the spinal marrow. These two species it is not easy to distinguish, and the existence of the former cause must be inferred, when we find that the lower half of the body is paralytic without proof of disease of the spinal chord. We also generally find on inquiry, that some uneasy sensations about the head, some derangement of sight or hearing, some pain or giddiness, and some confusion of memory, has preceded the appearance of the paralytic symptoms. Baillie informs us, he has often remarked paralytic dropping of the eyelids, and an amaurotic blindness of one or both eyes.

Dr Baillie, who has drawn the attention of physicians to this form of palsy, thinks it depends on some action of the vessels of the brain or its membranes secreting a morbid fluid, which falls down into the spinal canal, and thus compresses the origins of the locomotive nerves. To this strange notion, he seems to have been led by the idea that it was impossible for any part of the brain to be so compressed or injured without giving rise to sopor, or without the palsy being confined to one side. If, however, we suppose a slight degree of the injury of the

brain which takes place on one side in *hemiplegia*, to take place in both hemispheres either of the brain or of the *cerebellum*, the limbs will become paralytic on both sides, producing in this manner the cerebral paraplegia. Instances of this are found in the writings of authors on morbid anatomy. The same form of *paraplegia*, or what may be termed double hemiplegia, I have seen result from general injection or chronic inflammation of the membranes of the brain.

Of the ordinary form of *paraplegia*, that succeeding to disease of the spinal chord, the pathology is pretty well understood. It depends in all instances, not so much on pressure by the deformed spine, as on vascular injection and its consequences, effusion of blood, serous fluid, or purulent matter, on the surface or into the substance of the spinal marrow. In some instances after these causes have ceased to act, the disease disappears, and the patient recovers the use of his limbs. (See also Book II. Chapter v. § ii. p. 381.)

The remote causes of these forms of palsy are much the same as those of apoplexy, and their operation and influence will be easily understood from what has been already said on that head.

III. Of partial palsy, little more need be said, than that it depends on the same state taking place in the trunks of those nerves which go to the affected muscles, which occurs in the brain, and gives rise to the more general affection. Thus, if chronic inflammation, bloody effusion, purulent destruction affect the axillary plexus, or any of the nerves which issue from it, the muscles of the arm lose more or less of their power, and become shrunk and withered. If a person is suddenly struck with loss of speech, it will be reasonable to infer that the hypoglossal nerves are more or less injured or compressed. And if one of the lower extremities becomes paralytic, it is requisite to inquire if there are no indications of affection of the lumbar nerves or of the sciatic nerve on that side.

IV. *Gastro-intestinal Palsy*.—Cases of palsy of the lower extremities, dependent on disorder of the alimentary canal, have been noticed by various physicians, both in ancient and modern times. Known by Hippocrates and various physicians of antiquity, under the general name of *Paresis*, they were also observed by numerous modern authors, and have, in connection with pain in the back, attracted the attention of Ludwig and John Peter Frank, and without this circumstance the notice of Kirkland and Abernethy. The latter, especially, records several cases of

palsy of the lower extremities, in which neither lesion of the vertebræ nor of the spinal chord could be discovered, or the usual remedies were unavailing, and which were removed by correcting a bad or disordered state of the stomach and intestinal canal.* An imperfect or incomplete form of paraplegia I have seen taking place in persons in whom the bowels had been long disordered, especially with obstinate constipation. It differs from the paraplegia ensuing on disease of the spinal chord or vertebræ, in so far as it is hardly ever complete, and is rather a species of stiffness and loss of control over the muscles. This I believe to be the same disease which I have elsewhere shown was first well understood by Ludwig, afterwards by John Peter Frank, under the name of *Rachialgia*, and has since that been explained by Joseph Frank and Dr Bradley. The theory of this disorder is not very clear; but it has been generally explained, by saying that the splanchnic nerves, being irritated at their intestinal extremities, this irritation may be reflected to the spine, and there act in disordering the energy of the spinal nerves, and their influence over the muscles of the lower extremities. The disease is not, in strict reasoning, referable to the present head, in so far as there is no proof that it depends either on hemorrhagic injection or on hemorrhage. It deserves, nevertheless, to be noticed, from the readiness with which it may be confounded with paraplegia.†

THERAPEUTICS.—The treatment of *hemiplegia* and *paraplegia*, depending on a morbid state of the brain, may be comprised in a few words. As the morbid cause is the same with that of apoplexy, it requires the same remedies adopted with the same energy and promptitude. Blood-letting should be performed without loss of time, to the extent of 20, 25, or 30 ounces, according to its effects, and repeated, if little or no impression is made on the state of the limbs. At the same time the head should be shaved, cold applied, and the bowels ought to be emptied by efficient purgative medicines. If the limbs after this still continue paralytic, blood must be drawn from the head, by means of leeches applied to the temples or hind-head, or cupping the nape of the neck. In most cases, decided benefit will begin to appear from the use of these measures. If the limbs have not completely recovered their power, the local

* The Constitutional origin of Local Diseases, Section i. p. 96..116.

† For fuller information on this subject, I refer to the Edinburgh Medical and Surgical Journal, Vol. xlv. p. 433, Edinburgh, 1836.

bleeding should be repeated, and, at a suitable interval, it should be followed by blisters to various parts of the head, more especially the hind-head. A seton or an issue inserted into the nape of the neck is of sovereign use also in removing the congestive state of the brain, where the palsy has been slow and gradual in its approach. At the same time, the action of the bowels ought to be continued by means of suitable purgatives; and every part of the antiphlogistic regimen should be rigidly observed.

The antimonial wine, or the antimonial solution with laudanum, is sometimes beneficial in restoring the healthy state of the cerebral circulation, and preventing a relapse.

To the safety of opiates, Dr Heberden bears testimony. But, notwithstanding the force of the argument derived from experience, it may be doubted whether this eminent physician made the true distinction of the proper season for their employment. In the beginning of the disease, while there is still vascular injection and distension, their operation can be of no use, and may be injurious. Afterwards, when this state has been removed by evacuating remedies, they are useful as in other instances of congestion, by removing capillary irritability, and restoring the healthy state of the cutaneous circulation. It is evidently to this stage of the disorder that the successful employment of opiates, as mentioned by Heberden, is applicable; and to this season, and to this mode of exhibition, it ought to be restricted. If opiates are safe alone, according to the experience of Heberden, I infer that they must be much more so when given after suitable evacuation, and combined with antimony.

On the subject of stimulating medicines in the treatment of palsy little need be said. They were introduced at a time when the true nature of the disease was not understood; and the trifling and variable success, which appears to have followed their employment, proves that they are, when free from harm, utterly incapable of doing any good. Even the gross mechanical theory on which Cullen admitted their employment,—"that they might be applied so as to force open the compressed nerves," shows only what extravagant notions may be adduced to explain facts, the existence of which is not established, and to reconcile contradictions which arise from erroneous observation and fallacious judgment. The only light in which the favourable operation of such agents can be understood, is

when, like a common blister or sinapism, they inflame the skin, and thereby induce a counter-action, or external morbid process, which may diminish or suspend the internal congestion. In this manner, we explain the operation, and recommend the use of blisters, sinapisms, tartar emetic, or sulphuric acid ointments, caustics of potass, butter of antimony, or nitric acid, embrocations of hartshorn, turpentine, hot salt, and similar irritants. Friction is of little moment, unless in local affections.

The effect of the hot bath and of the cold are equally ambiguous. The former may excite the whole vascular system, and aggravate that congestion which it was intended to remove; the latter may be suddenly followed by such irregular accumulation as to induce a fresh disease or even rupture, ere it has time to produce its ultimate and beneficial effects on the secretions. Nor can electricity or galvanism be used with greater safety, or a more certain prospect of success to remove congestion or effusion within the head or spinal marrow. Electricity has been found to augment much the discharge from blistered surfaces (Cavallo); and in this manner it may occasionally do good, by inducing a more powerful counter-irritation. But, in most instances, no amelioration follows; and in those in which it does, it is manifestly independent of the electrical shocks.

In the treatment of palsy various narcotico-acrid substances have been at different times tried. The principal of these are, the leaves of the poison-oak (*Rhus toxicodendron*); the flowers and root of the leopard's-bane (*Arnica montana*); and the powder or extract of St Ignatius' bean (*Strychnos nux vomica*.)

The first of these was employed with advantage in various paralytic affections by Dr Alderson of Hull, and some of his friends. The dose is half a grain of the powdered leaves three times daily, to be increased to two, three, or four grains, according to its effects, which must be assiduously watched. The operation of the drug is known by a tingling or pricking sensation in the paralytic part, which soon becomes affected with convulsive motions. These effects are said to continue till the muscles regain their entire power. Leopard's-bane (*Arnica montana*.) was introduced to notice by Juncker, Eschenbach, Collin, Plenck, and other German physicians, who praised its virtues in the treatment of palsy. It was given in the form of infusion, prepared from a drachm or half an ounce of the flowers in a pint of boiling water. This medicine produced,

according to its dose, emetic, sudorific, or diuretic effects; and its operation on the paralytic parts appears to have been not unlike that of the poison-oak. The experiments of Francis Home do not speak much in favour of its sanative powers.

More recently the powder or extract of the bean of St Ignatius, a most intense bitter, has been recommended to attention by the experiments of Fouquier of La Charité, in Paris, who has found it very successful in the treatment of several cases of palsy. The dose was at first small, one or two grains of the spirituous extract, in the form of pill, but successively augmented to 20, 30, or even 50. In larger doses it produces delirium, a sense of heat and oppression, anxiety, sometimes tetanic rigidity, loss of speech and swallowing, with difficult breathing and palpitation. In more moderate doses, its operation on the system is followed by heat, tingling, and convulsive motions of the palsied limbs, which are said at length to recover gradually their powers of voluntary motion. This remedy, either in the form of spirituous extract, or the alkaloid strychnia, has been tried in this country by Dr Dickson of Clifton, Dr Bardsley of Manchester, Mr Rose of Swaffham, Mr Mart, and various practitioners in France, in general with analogous effects. It should not be exhibited till blood-letting, purging, and similar evacuations have been employed; and it seems best suited to old cases of palsy, when the morbid condition of the brain or spinal marrow, which induced the loss of power, has either abated or partially disappeared; or to local affections in which the structure of the brain is not injured, and a nervous trunk or branch only is diseased. For further information on the indications for the use of strychnia, and on its physiological and therapeutic effects, I refer to Book II. Chapter v. §. I. (p. 377,) of the present volume.

The treatment of the *paraplegia* arising from disease of the vertebræ and spinal chord has been sufficiently well ascertained since the time of Pott. Congestion, inflammation, and its products, are the causes of the palsy; and the remedies are those which remove these states. Blood should be drawn from the painful part of the spine by leeches or cupping, until the pain is abated. When this has been carried to sufficient extent, if dull pain still continue, a blister may be applied once and again. Lastly, an issue by caustic potass, moxa or other means, should be established as near the part as possible. Rest in the horizon-

tal posture is of some moment to take off pressure from the tender part of the spinal marrow. These measures, with attention to the state of the general health, will, if seasonably employed, succeed in restoring most cases of spinal paraplegy.

In the treatment of local forms of palsy, the same principles are to be kept in view. In aphony, or loss of speech, either after apoplexy or primarily, blood should be drawn from the nape of the neck and behind the ears; blisters should be applied repeatedly till amendment appears; and, if these fail, a seton or an issue should be inserted in the nape of the neck. If the countenance is distorted from palsy of the muscles of one-half of the face, the same remedies may be employed. When the urine cannot be retained and escapes involuntarily from palsy of the sphincter of the bladder, the most effectual remedy is a blister over the loins and sacrum, to be repeated if amendment does not follow. (Medical Observations and Inquiries, Vol.ii. Art.xxvii.p. 311.) When there is reason to suspect that the lumbar nerves or the great sciatic is the seat of disorder in palsy of the lower extremities, blood must be drawn from the loins by leeches and cupping; leeches should be applied along the course of the sciatic nerve; and this should be followed up by repeated blisters applied over the origins and course of this nerve, until the skin becomes more sensible, and the muscles recover some degree of their voluntary power. If this does not ensue, then an issue, formed either by moxa, the actual cautery, or some of the chemical caustics, should be applied behind the great trochanter, or the skin covering the trunk of the sciatic nerve. I have rarely seen cases of local palsy depending on affection of this trunk resist this treatment, if seasonably commenced and judiciously conducted.

At the same time, in each of these forms of local palsy it is of much moment to attend to the general health and the functions of the alimentary canal. If the skin is dry and harsh, the tongue foul, the taste of the mouth bitter, metallic, or otherwise unnatural, and the bowels slow or irregular, there is reason to think that the secretions of the gastro-enteric mucous membrane are not healthy. Purgatives should be administered until some favourable change takes place in the symptoms; and the diet should be regulated so as to contribute to the same effect.* Small doses of antimonial wine, or of the antimonial solution, will also be useful.

* Abernethy on the Constitutional Origin of Local Diseases, p. 104, note.

BOOK IV.

DISEASES CONSISTING OF COMPLEX LESIONS.

THE diseases of which I have already treated are in general distinguished by the circumstance of consisting in, or being attended with, some simple lesion, which may be known either by peculiar features, or by characteristic effects. There are, however, many diseases which either do not consist of one simple lesion, but embrace several simple lesions, or which, being the effects of diseases consisting of simple lesions, are at length complicated with these and with their effects. There are also not a few diseases in which the pathological cause of the symptoms, however uniform it may be in reality, is not so to the observation of the physician. To the former class belong a number of diseases of the lungs, heart, and other compound organs; and to the latter class may be referred various diseases of the nervous system, the presence of which is indicated by various derangements in the organs of locomotion and sensation. These diseases do not admit of any very methodical arrangement; and I shall consider them in the following order, which I submit not as the best, but as the most convenient of which the subject admits. I. Diseases of the Lungs; II. Diseases of the Heart; III. Diseases of the Glands, especially the Kidney; and, IV. Diseases of the Nervous System.

CHAPTER I.

COMPLEX DISEASES OF THE LUNGS.

§. I. Breathlessness. *Dyspnœa*. Panting. *Anhelatio*. Continued Asthma of Sir John Floyer and Dr Bree. Emphysema of the Lungs.

Recherches sur l'Emphyseme des Poumons, par M. Louis, Medecin de la Pitié. Memoires de la Societé Médicale d'Observation, Tome i. p. 160—264. Paris, 1837. 8vo.

It has been too much the practice of nosological authors to admit these forms of disordered respiration as primary diseases; and though Cullen was aware of this being inconsistent with good pathology, he did not think himself warranted in deviating so far from established custom as to exclude the several forms of difficult breathing from a place in his nosology. It is not to be doubted, however, that every species of breathlessness (*dyspnœa*), marked by authors, is a mere symptom of some other disease; and it would be quite as reasonable to convert cough, with which it is almost invariably attended, into a primary affection, as to retain this in a correct and pathological enumeration of diseases.

My only reason for giving what is a mere symptom a place here, is because the form most frequently seen is that dependent on emphysema of the lungs. This, I have already said, is itself an effect of chronic bronchial disease, and therefore belongs to that head. In many persons, however, in whom the disease has proceeded to the chronic state without being attended with active symptoms, a set of phenomena take place so characteristic as to deserve special attention.

In such persons, it is observed that the breathlessness becomes progressively so urgent, that respiration is often totally impracticable, unless in the erect position, or even with the person inclined a little forward; and sometimes when the individual attempts to lay down he feels it most easy to lie prone, and any attempt to lie supine is attended with a sense of impending suffocation. To this condition the name of *Orthopnœa* is applied.

Respiration is also performed in a peculiar manner. It is performed more rapidly than usual, the muscles being moved from 30 to 32 or 36 times in the minute. Inspiration, also, is

very short, and is immediately followed by expiration, which is prolonged to at least double, sometimes three times, the duration of inspiration. The ribs also are moved, but not nearly to the same extent as the diaphragm. The accessory muscles are also called into action, viz. the pectoral muscles and the sterno-mastoid. The abdominal muscles also, especially at the flanks, move extensively and powerfully, and are much contracted at the close of expiration. But the most remarkable symptom of this breathlessness is, that, at the close of each expiration, there is formed a deep hollow or pit in the epigastric region, immediately below the sternum, which corresponds with the great effort to expire. In persons in whom respiration has been performed for a considerable time in this abnormal manner, the lower end of the sternum is drawn inward, and made to approach the spine, while all the cartilaginous extremities of the ribs are, in like manner, drawn forcibly inward, so that the whole lower circumference of the chest is contracted. The chest also before becomes more or less arched.

When the chest is examined by percussion, it emits, especially all over its anterior surface, a sound unusually clear, almost similar to that emitted by an empty cask. This tympanitic sound, as it is named, is an indication that the lungs are emphysematous. The same sound, though less clearly, is emitted by the posterior part of the chest.

When auscultation is employed, the motions of respiration are found to be accompanied all over the chest, but especially opposite the large-sized tubes with the sonorous rhonchus, mixed with the sibilous wheeze, which is emitted by the smaller-sized tubes. In some parts, especially towards the lower part of the chest, the moist mucous rattle or the fine mucous rattle is heard.

When the heart is examined, its beats are seldom heard with the natural distinctness. Most usually they are obscured by the motions of respiration, and by the emphysematous lung overlapping and concealing the organ, and thereby obscuring its sounds. The beat, when it is heard, is clear, unusually clear, indeed, and sounds as if a small wooden hammer struck on a bit of caoutchouc. When the disease has been long continued, most usually the cardiac beats are heard and felt, not in the cardiac region, but in the epigastric. In this case, also, the impulse of the heart is heard in other parts of the chest, if the sounds be not veiled by the loudness of the respiratory sounds. The symptoms now mentioned indicate dilatation and partial

hypertrophy of the right ventricle, with detrusion of the heart—an effect which is often the result of the state of the lungs now mentioned.

Cough is in general frequent and urgent in this disease, especially during the night, and in the horizontal position. Sometimes expectoration is scanty; at other times abundant; and in the latter case it consists of opaque puriform mucus, part of which sinks in water.

The physiognomy of patients in this disease is very characteristic. It may be of two kinds. In the one case the complexion is pale and earthy, and sometimes cadaverous, with the features sharp and pointed, and a great expression of anxiety and distress, while the nostrils are in frequent laborious action. In others the complexion may be a little red, or rather purplish, and with a livescent tint, the cheeks blue, the lips blue, the tongue dark-coloured, and the conjunctiva more or less traversed with vessels loaded with dark-coloured blood, while the whole face is something distended and bloated.

The larynx is observed to move very extensively, and with the same rapidity as the chest.

This disease may continue for a considerable time, during which the patient has periods of amendment, alternating with attacks of aggravated breathlessness. It rarely terminates in health, however, and its natural course is either to the fatal event, or to diseases which terminate fatally. In the former case, in some attack more formidable than any previous one, the respiration becomes progressively more laborious, and cannot be performed unless in the sitting posture, and death takes place by suffocation. In the latter, dropsical effusion takes place within the pleura, and in the lower extremities, and the patient may expire by slow agony, or be speedily destroyed by suffocation.

MORBID ANATOMY.—The cartilages of the ribs are often found more or less ossified. The chest itself is strongly arched. The lungs do not collapse, but rather protrude from the chest, and the whole of the anterior surface, especially from the lower two-thirds, are whitish-coloured, the whiteness increasing at the margins and diminishing towards the centre of the lungs. This appearance depends upon the presence of air in the filamentous or cellular tissue of the lungs, where it may be pressed and made to crepitate beneath the fingers, the im-

pression of which it usually receives. In various extreme cases the air is forced out of the pulmonic cellular tissue, immediately beneath the *pleura*, at the margin of the lungs, and elevates the *pleura* in the form of bladders or vesicles of various sizes. The posterior and inner regions of these organs are red-coloured, or even bluish and loaded with dark-coloured blood. The bronchial tubes are always filled with a good deal of puriform mucus, sometimes tinged with blood; and on removing which the bronchial membrane is red and often rough. When the tubes are laid open to their ends, they are often found completely obstructed by viscid mucus, and sometimes their area is contracted by the membrane being thickened. The vessels of the whole posterior part of the lung is loaded with dark-coloured viscid blood; and the substance of the lung itself is infiltrated with dark-coloured bloody serum.

In some instances the two *pleuræ* are united by adhesions. In others, the free surface of the membrane is healthy. Occasionally a little blood-coloured serous fluid, and in some instances a considerable quantity, is found in one or both *pleuræ*.

The heart is totally covered by the emphysematous and distended state of the left lung, and not unfrequently it is thrust to the sternum and downwards. The right chambers are always distended with blood; and very commonly the right ventricle is dilated, and hypertrophied or thickened and indurated at the base of the ventricle, and between the right margin and septum, that is, at the part corresponding to the origin of the pulmonary artery. The left chambers are generally empty; and not necessarily diseased. Sometimes, however, the rest of the heart is flaccid and soft, or in a state of atrophy.

PATHOLOGICAL DEDUCTIONS.—The facts now stated show that this disease is the effect of chronic bronchial inflammation, or vesicular *bronchitis*, and unavailing efforts to cough up the viscid mucus secreted by the vesicular membrane. It is always induced by a previous attack of *bronchitis*, and tends necessarily to produce dilatation and partial hypertrophy of the right ventricle.

ETIOLOGY.—The causes of breathlessness are all those of chronic bronchial disease. For instance, it is a sequela of acute or subacute *bronchitis*, and in this manner it is often a sequela of measles or small-pox. It is also caused by the presence of induration of the mitral valve, and arctation of its aperture;

by hypertrophy of the left ventricle, disease of the aortic valves, and aneurism of the arch of the aorta or the innominata. When proceeding from dry *bronchitis*, it is very often hereditary.

THERAPEUTICS.—The treatment is much the same as that already stated for chronic bronchial disorder. Small blood-lettings, mostly local, with frequently repeated doses of opium or its preparations; blisters, sinapisms, and nauseating diaphoretics, and expectorants, as tartrate of antimony and ipecacuanha, with regulated diet, rather vegetable than animal, and an issue between the shoulders, comprise all that medicine can effect.

§. II. Asthma.

A Treatise of the Asthma. By John Floyer, M. D. London, 1698, 8vo, and London, 1745.—Medical Advice to the Consumptive and Asthmatic People of England. By P. Stern, M. D. London, 1767.—Dissertatio Inauguralis de Asthmate Spasmodico quam, etc. eruditorum examini subjecit. By Thomas Ryan. Edin. 1784.—Treatise on the Asthma. By Thomas Withers, M. D. Lond. 1786, 8vo.—Observations on the History and Cure of the Asthma. By Michael Ryan, M. D. London, 1793, 8vo.—A Practical Inquiry into Disordered Respiration, distinguishing the species of Convulsive Asthma, their Causes, and Indications of Cure. By Robert Bree, M. D., F. R. S., &c. 5th edition. London, 1815.

THE term *Asthma* has been long in common use, both among professional persons and the vulgar, to denote every species of difficult breathing, whatever the cause might be. Thus, it is common to hear persons labouring under empyema, pulmonary consumption, and other pulmonary disorders of long standing, called *asthmatic*; persons with evident signs of thoracic or general dropsy are said to be *asthmatic*; and there is no doubt that the breathlessness arising from various diseases of the heart and large vessels is very often, by superficial observers, denominated *asthma*. Even nosological authors, who have admitted *dyspnœa* as a primary affection into their system, have distinguished asthma from it, principally in being more severe. This error has not been avoided even by Laennec, who founds the character of asthma on the severity and permanence of the difficult breathing.

Sir John Floyer describes a species of asthma which he terms *periodic*, as he observed it to return at periods, or after certain intervals, in his own person. But it is to Cullen that we are indebted for distinguishing this disorder with accuracy, as coming on in fits, after intervals of healthy breathing, and for giving a luminous description of its symptoms, the general fidelity

of which has since been confirmed by the observations of Dr Bree on this disease, as it appeared in his own person. I follow the distinctions of these authors in using the term *asthma* to signify that disorder only in which the breathing, previously healthy, or, at least, not unnatural, becomes in the course of a few hours very difficult, short, and panting, with wheezing, sense of tightness in the breast, and laborious exertion of the dilating muscles of the chest; with little or no cough at the beginning of the fit, but becoming free, and with expectoration of sero-mucous fluid towards its termination.

The asthma thus defined is often a hereditary disease. It seldom appears in early life before puberty, but generally in the course of manhood. Though it effects both sexes it is most common in the male. It seems to attack all temperaments, but most particularly the melancholic. It generally appears in persons of full habit, but seldom continues long without causing considerable emaciation.

The attacks of asthma generally take place in the night-time, or towards the approach of night. When Cullen maintains that there are instances of their coming on during the day, it is not improbable that these were examples not of asthma, but of *angina pectoris*. The attack is generally preceded by such symptoms as denote disorder of the stomach and alimentary function. These are, a sense of flatulence and distension in the stomach and bowels; eructation of wind, with water, insipid or sour; and a heavy pain over the forehead and eyes. As evening approaches, this weight over the eyes becomes more oppressive; the patient, if alone, becomes sleepy; if occupied with company or conversation, he is sensible of some shortness of breathing, with precordial anxiety and restlessness, which make him peevish and fretful, and long for open air and free respiration. These sensations are sometimes attended with tingling, heat in the ears, neck, and breast, and some desire to expel the contents of the bowels, with much uneasiness of the abdominal muscles.

At some uncertain hour before midnight, the patient becomes suddenly sensible of the increased violence of the disorder. After being asleep for some short time, he awakes all at once, with great difficulty of breathing, and a sense of tightness and constriction across the breast, as if the lungs were enclosed in a ligature, which make him feel the immediate necessity of the erect posture, and free exposure to the cool air.

Inspiration is performed with great difficulty and much effort of the muscles ; yet the chest is never fully dilated, nor does the diaphragm descend with its wonted ease, but as if against an opposing force ; expiration is performed slowly, and apparently with pain and reluctance, and both motions are accompanied with more or less wheezing. The patient can seldom speak ; and though there may be some desire to cough, it is generally impracticable. The pulse may be natural, but is generally a few beats quickened, and is always small. Heat and thirst are said to be observed only when the disease has been induced by indigestion or an intemperate meal. The urine is copious and pale at the beginning and during the course of the fit, but at the close it is voided of the ordinary quantity, highly coloured, and generally deposits a sediment. The countenance is generally pale and shrunk ; and the mind continues fretful throughout.

These symptoms, which constitute what is termed the fit of asthma, may continue for many hours together, sometimes from midnight till the morning is far advanced. Some remission of the symptoms then gradually takes place. The sense of constriction in the chest abates or ceases ; the breathing becomes less laborious and slower ; the inspirations are longer and more full ; expiration gives less uneasiness, and the patient can speak and cough with comparative ease. The cough generally brings up some mucus, after which the remission becomes more distinct, and the patient, being sensibly relieved, soon falls into a much wished for sleep.

After awakening in the morning, the patient feels his breathing freer and easier than during the night, but not quite natural. He still feels some tightness across his breast, cannot breathe easily in the horizontal posture, and cannot attempt any corporeal motion, or attend to business requiring mental effort, without feeling a return of his breathlessness and uneasy sensations. If these, however, are avoided, the breathing continues to become easier in the course of the day, and the patient enjoys an interval of tranquillity till the afternoon. The dyspeptic symptoms then recur ; and in the evening the breathing again becomes difficult, and threatens the same torment as the previous evening. In short, it either gradually increases to its former intensity ; or, if the patient enjoys some uneasy and wheezing sleep in the early part of the night, he is

sure to be awakened about midnight, or between that and two in the morning with the same sense of stricture in the lungs, the same painful and laborious breathing, and the same urgency for the upright position and free air, as during the previous night; and these symptoms run the same course as before. The sleep, however, after this second fit is generally more sound and refreshing than after the first.

In this manner, fits may return for several nights successively; but, in general, after a few nights passed in this manner the remissions become more complete; and this is generally greater as the expectoration is more copious in the morning, and continues to a greater or less extent during the day. Thus on the morning of the third day, the expectoration is more abundant and the relief more complete than in the previous morning; and after the fit has recurred the third time, the expectoration is so easy and copious, and the relief so great on the morning of the fourth day, that the disease may be regarded as on the decline; and, though fits may occur a fourth and a fifth time, it generally terminates within a few days. This result may be anticipated not only from the abundance and freedom of the expectoration, but from the urine being less copious, less watery, and higher coloured, from the pulse becoming stronger and fuller, from the strength returning, and the mind recovering its natural serenity.

The expectorated mucus is said to be sometimes black, or to have a dark-blue tinge. This appearance, which is not constant, depends on admixture of blood, which afterwards undergoes dissolution. It may also be streaked with recent blood.

This is the description of the genuine spasmodic asthma in its most ordinary form. Dr Bree admits other three species, distinguished chiefly by the causes which produce them, viz. the *dry asthma*, or that from ærial acrimony, asthma from gastric and abdominal irritation, and habitual asthma. The third cannot well be distinguished from the first, unless in the cause from which it arises; and in this respect it has been already noticed in another place. The fourth species is nothing but the first become confirmed and inveterate by long habit, and does not admit of distinction either in pathology or practice. The second species is said to be distinguished by taking place more frequently during the day than by night, by being without wheezing, and by being attended with little or no expectorati-

ed mucus. As even on this last symptom authors are not agreed, it is sufficient to notice the mention of this species without giving it any further consideration.

Asthma is generally observed to appear in the first instance after some catarrhal affection mistreated, protracted, or unusually severe. Residence in a damp house, sleeping in a damp bed, are not unfrequently said to be causes which produced it. A condition not uncommon, which operates as a disposing cause, is the plethoric and nervous state which is induced by long habits of intemperance and derangement of the alimentary function. In some persons addicted to these habits, the assimilative powers are so active that the vessels are filled with blood more rapidly than either nutrition can apply it to the growth and maintenance of the organs, or the excreting organs can discharge what is superfluous. In such persons a moderate exciting cause, as catarrh, or the cold and moisture which produces it, may readily give rise to the formation of asthma. It is thus that dyspeptic symptoms often precede the appearance of the disease.

When asthma has once taken place in the manner above described, it is liable to return at intervals during the whole subsequent course of life. These returns depend on different circumstances in different persons. In some the disease returns regularly, in consequence of the more or less continued operation of the remote causes which originally produced it. In others, this operation is rendered more effectual by the additional influence of certain circumstances which are regarded as exciting causes.

1st, In some persons fits are excited by external heat, either of the weather, of a crowded apartment, of a warm chamber, or of the warm bath. In such persons fits are more frequent in summer, especially when the heat is intense, than in cold seasons; and they may also appear when the temperature of the air changes suddenly from cold to considerable heat, or when the atmosphere at the same time becomes lighter and less dense. In the same kind of subjects, fits may occur after exercise, by which the circulation through the veins is quickened, blood is accumulated in the lungs, and the body is heated; after a full meal or unusual distension of the stomach; and after the use of wine and other stimulants. It is perhaps on the same principle that the exciting passions and emotions are of-

ten succeeded in asthmatic persons by a severe fit. Thus anger, joy, and the gratification of the sexual passion, are exceedingly injurious.

2*d.* In other cases, the qualities of the air inspired seem to be the circumstances on which the occurrence of fits depends. Not only air impregnated with smoke, minute dust, and other vapours are accused of producing asthmatic fits; but the atmosphere of particular places has great influence upon different persons. A gentleman, of acute mind and general intelligence, informed Dr Bree, that he never slept in the town of Kilkenny without being attacked by asthma; yet the late Lord Ormond rarely escaped a fit when he slept in any other place. The air of this town is believed to be strongly impregnated with carbonic acid from the combustion of the Kilkenny coal. (Bree, p. 368.) The effect of this impregnation, however, if not doubtful, is exceedingly difficult to be understood. Sir John Floyer lived in Oxford twelve years, during which he had little distress from his complaint; but he never visited Staffordshire, his native air, without suffering one or two severe fits. Dr Bree himself, after the disease was once established, never visited the elevated land of Warwickshire without suffering paroxysms of considerable severity.

3*d.* In other cases, strong impressions on the nervous system are the only causes to which the occurrence of fits can be ascribed. Thus certain odours, as musk, the odour of the rose, various flowers, and other strong perfumes, are in many asthmatics followed by distinct fits. Exposure to certain effluvia or subtile vapours, as those of ipecacuanha, sealing-wax, and other burning substances, are also followed by asthmatic fits. In summer, during the period of hay-making, many persons are liable to more or less difficulty of breathing, with dry cough; and which has been generally ascribed to the exhalation proceeding from the grass or some of the plants cut down with it. This disorder has been named the Hay Asthma or Hay Catarrh, according to the form which it assumes.

PATHOLOGY.—The pathology of asthma is not well understood. Its appearance in the form of fits, with intervals of sound breathing, shows that it is a disorder of function in the first instance; whether future experience is to prove that this transitory disorder may or may not depend on organic charge. It has been maintained, of late years, by Corvisart, Laennec, and their followers, that most instances of

asthma were actually one organic disease or other of the lungs, the heart, or great vessels, of which the asthmatic breathing is merely symptomatic. This is true of mere difficult breathing when permanent (*dyspnœa*); and it is by overlooking the distinction between this affection and spasmodic asthma, that these physicians have come to express the opinion now delivered. Dr Bree has been at some pains to collect from many authors the evidence of dissection concerning the pathological and organic causes of disordered respiration; but though it may be justly stated as the result of his inquiry, that no instance of permanent breathlessness exists independent of some malformation, morbid growth, or organic change, either in the lungs, in the heart, or the large vessels connected with them; yet he has not succeeded in adducing one well-authenticated example of any of these diseases giving rise to the symptoms of genuine periodic asthma. When the character of the disease, in short, is circumscribed in the manner attempted above, and distinguished from ordinary dyspnœa, the difficulty of ascribing the symptoms of asthma in all cases to organic change in the lungs, heart, or great vessels, is obvious. In the *first* place, almost all the organic diseases of these parts produce permanent difficulty of breathing, without intervals of ease and good health. *Secondly*, fits of asthma may return at intervals for many years of a long life; while in diseases of the lungs, heart, &c. the breathlessness continues and increases till the fatal event. *Thirdly*, though asthma may terminate in fatal disease of the lungs, yet, in some instances, under good management, it disappears, and the individual dies with disease neither of the lungs, nor of the heart. *Fourthly*, Laennec states in the last edition of his work, that he has seen several dissections of persons who had laboured under genuine asthma, yet he could detect in their lungs no appreciable lesion to which the asthmatic symptoms could be ascribed.

Putting, therefore, organic changes as a uniform cause of asthmatic symptoms out of the question, the pathology of the disease must be sought for elsewhere. Two theories have been proposed, each of which are entitled to some attention. The first is that of Cullen, which has been recently adopted by Laennec. The second is that of Dr Bree, the author whom I have already had occasion to mention.

Cullen inferred from the phenomena of the disease, that its

“proximate cause is a preternatural and a spasmodic constriction of the muscular fibres of the bronchiæ, which not only prevents the dilatation of the bronchiæ necessary to a free and full inspiration, but gives also a rigidity which prevents a full and free expiration.” He further supposed that this constriction, like other convulsive and spasmodic affections, is readily excited by turgescence of the blood, or other cause of any unusual fulness and distension of the vessels of the lungs. The principal objection to this theory, which is certainly ingenious, was the uncertainty of the existence of muscular fibres in the bronchial tubes. It is believed that this objection is now removed by the researches of Reisseisen, who believes that he has found fibres of muscular structure and property, not only between the extremities of the bronchial cartilages, but in the smaller tubes where cartilages are wanting. Laennec admits the accuracy of this fact in the case of bronchial tubes less than a line in diameter; and though it is difficult to trace these muscular fibres in smaller canals, he agrees with Reisseisen in trusting to analogy for the fact not only in them, but even in the pulmonic vesicles, or what are commonly termed air-cells. He therefore infers that these fibres are liable to spasmodic constriction, and that this is the cause of the asthmatic paroxysm.

Dr Bree, on the contrary, contends that there is no evidence of spasmodic constriction, though he does not deny its possible existence. Ascribing, then, the convulsive motions to the external muscles of respiration only, he infers that they are roused to inordinate and violent action by the presence of some irritation in the lungs which it is the object of these motions to counteract and remove. This irritation he then finds to be an unusual quantity of sero-mucous fluid in the pulmonary exhalents, which, instead of being poured out, as usual, in the bronchial membrane, is retained, and causes the fulness, tightness, and oppression in breathing.

This theory is not satisfactory, and is more open to objection than that of Cullen. Admitting the existence of the sero-mucous fluid in the pulmonary capillaries, Dr Bree does not show what is the cause of this unusual load of fluid in these vessels; nor does he seem to remember that, if this load of fluid was actually in the situation which he assigns to it, it would produce not a transitory and paroxysmal, but a permanent diffi-

culty of breathing. In short, though Dr Bree admits the paroxysmal character of asthma in his description, he overlooks it in his pathology, in as much as he considers periodic asthma and permanent breathlessness as of the same nature ; and this forms the whole amount of his argument against the doctrine of Cullen.

Upon the whole, unless the existence of asthma as a transitory and paroxysmal affection is absolutely denied, it must be admitted that it consists in an action of some part of the lungs or their vessels partaking of the nature of spasm ; but whether this spasmodic action or constriction is seated in the bronchial tubes, or the pulmonary capillaries, or in both at once, it is at present impossible to determine.

Dr Parry gives a different view of the pathology of asthma. From considering the predisponent and exciting causes by which it is usually induced, and the circumstances and agents under which its symptoms are alleviated and subside, he thinks it quite established, that its symptoms depend on such a preternatural fulness of the vessels of the mucous membrane of the bronchial tubes, as to impede free respiration. There is no difficulty in understanding, he argues, how vascular fulness of the bronchial and vesicular membrane should produce difficulty in inspiration by mere mechanical diminution of diameter. (*Elements of Pathology and Therapeutics*, 470–478, p. 197, &c.)

All this is perfectly true ; but it does not account for the sudden accession of this vascular fulness and its speedy disappearance. The difficult point in the pathology of asthma is the recurrence of the symptoms at certain periods, and the circumstance of intervals of comparative natural breathing enduring for a considerable time.

I have hitherto viewed asthma as a primary and idiopathic disorder, not necessarily connected with lesion of the lungs or heart, cognizable by inspection after death. Various facts, nevertheless, incline me to think, that in several persons asthmatic symptoms are associated with morbid states either of the heart, or the lungs, or both.

First, It is observed that asthma terminates not unusually in dropsy. The latter, however, is an effect in general of some other disorder, most usually one or other disease of the heart. In this order of cases, therefore, it is reasonable to infer that the asthmatic symptoms have arisen from disease of the heart. Heberden mentions a case of this kind in which the mitral valve was indurated into a mass of shapeless tubercles.

Secondly, Both Heberden and Baillie mention, that in certain cases of asthma they had found no other morbid change except those air-distended bladders at the margin of the lungs, which I stated were found in emphysema of the lungs. This suggests the question, whether the *dyspnœa* in emphysema is uniform and constant, and whether in asthma there be really periods when the individual is altogether free from breathlessness and oppression. From the recent observations of Louis on the subject of emphysema, it results that a sense of oppression in breathing is constant, and that accessions of dyspnœa, amounting to orthopnœa, and the feeling of impending suffocation, recur at certain periods. There is no doubt that, in the cases described by this author, the emphysematous state of the lungs was found to be constant; but it is also certain that it was often associated with other lesions.

Thirdly, Attacks of difficult breathing are observed to come on suddenly, in consequence of affections of the larynx or windpipe, especially in consequence of affections of the glottis, and sometimes in consequence of catarrhal attacks occurring in persons labouring under disease of the heart, which has been proceeding in a latent manner, or without manifest symptoms. Thus some persons present several of the symptoms of hypertrophy of the heart, excepting dyspnœa and cough; but when these persons are exposed to cold, and are in consequence attacked by catarrhal or bronchial symptoms, the breathing becomes quickly difficult, frequent, and laborious, often amounts to orthopnœa, and continues in this state until, by suitable depletion, the catarrhal symptoms are subdued, when all the former asthmatic symptoms subside, and leave the respiration of the patient in a comparatively healthy state.

It the *fourth* place, fits of difficult breathing are observed to take place suddenly in persons labouring under aneurism of the *innominata* or arch of the aorta, and sometimes under tumours situate in the same position. In one case of aphonia, in which the patient had occasional fits of difficult breathing, an aneurismal tumour of the *innominata* was found. In another case, in which the difficult breathing came on very suddenly, and assumed all the characters of the spasmodic disease described by Dr Ley under the name of *laryngismus stridulus*, an aneurism was found at the arch of the aorta, and had induced some softening of the recurrent nerves.

If the difficult breathing in such cases as these be referred

to the head of asthma, the asthmatic symptoms are probably to be regarded as either dependent on, or complicated by, organic changes.

Lastly, In the body of a man of 45, who died on the third day of a paroxysm of convulsive asthma, M. De Jaer found the right ventricle and auricle and the whole venous system distended with blood and air, which rendered the blood frothy; and all the other organs were sound. M. De Jaer had often found a considerable quantity of air in the pulmonary auricle and ventricle in persons destroyed by convulsive asthma; but, as the inspection was made twenty-four hours after death, it might be ascribed to decomposition. In this case, the body was opened twelve hours after death. (Nysten, p. 174.)

THERAPEUTICS.—The treatment of asthma has been varied, irregular, and not well ascertained. As the pathology is not clear, a rational system could not easily be traced; and the empirical methods, which have been adopted, have not been very successful. I shall shortly state the means, the use of which has been followed with the most general success. What I am going to say refers to the management during the fits, and to the permanent and radical removal of them.

It seems to be generally agreed among physicians that little can be done during the accession of the fits unless to mitigate their severity, and shorten their duration. This is best done if the subject is young and plethoric, or at most not old and infirm, and the disease newly commenced, by blood-letting from the arm. When the disease has continued long, and produced considerable weakness and wasting, this evacuation seems to have less power over it, and, by impairing the general strength more considerably, to protract recovery, and render the patient more susceptible of future attacks. Of antispasmodics, those most in use are assafoetida in the form of tincture, the ammoniated tincture of valerian, sulphuric ether, opium in its different preparations, especially the ammoniated tincture, distilled spirits, the smoke of tobacco, and the smoke of stramonium. All of these remedies afford temporary relief; but none of them is entitled to the true character of an antispasmodic, or a remedy capable of putting a stop to the paroxysm.

The one most frequently resorted to is a mixture of laudanum, or solution of muriate of morphia, and sulphuric ether in equal parts, and of this a teaspoonful is often taken by asthmatics every hour or two hours, until some relief is obtained.

Other medicines, denominated antispasmodic, occasionally used, are the anodyne liquor of Hoffmann, the oil or the salt of amber, camphor, musk, and castor.

In general, the most effectual means of affording relief are those remedies which are employed so as to act on those states of the system by which the asthmatic symptoms are induced.

Next to blood-letting, the most powerful remedy is full vomiting, induced either by ipecacuanha or tartarized antimony, or both. After this it is always requisite to exhibit cathartics, so as to remove entirely the contents and bad secretions of the intestinal canal.

If, after the use of these means, the breathlessness continue, with rapidity of pulse, or even with natural pulse, tartarized antimony or ipecacuanha wine should be given in nauseating doses, until the breathing become less rapid and laborious. In general, under the use of one or other of these agents, considerable alleviation ensues; and very generally the alleviation is attended or preceded by expectoration of mucous fluid.

In some instances, opium affords very great relief; but where it does not, it is liable to enfeeble the action of the stomach, and induce flatulence and thirst.

Sir John Floyer found that the severity of his fits was occasionally much mitigated by having recourse to pretty strong Mocha coffee without milk. The beverage is slightly expectorant, and it is convenient for asthmatics to have it at hand.

The most effectual means of preventing the paroxysms from returning, consist in moderate, rather spare diet, chiefly of grain and milk, avoiding exposure to cold, preservation of mental tranquillity, avoiding entirely the use of spirits or fermented liquors, and residence in the country.

It is good to establish an issue or seton between the shoulders.

When the plethoric state of the system has been removed or diminished by means of depletion, antimonial, and low diet, it is important to strengthen the system by means of tonic remedies. For this purpose, sometimes bark and sometimes chalybeate medicines have been recommended; and occasionally their use has been followed by beneficial results. By far the best tonic, however, will be found in the practice of daily washing or sponging the surface of the chest, and even the whole trunk with cold water, and then rubbing it so as to render the skin quite dry. It is best to begin this practice with tepid water, and diminish the temperature, until it can be used cold.

§. III. Crowing Inspiration. *Laryngismus Stridulus*. Thymic Asthma of Kopp. *Asthma Thymicum*. Spasmodic Croup; Millar's Asthma; Cerebral Croup. Spasm of the Glottis of Dr Marsh.

Observations on the Asthma and on the Hooping-Cough. By John Millar, M.D. London, 1769.—A Treatise on the Diseases of Children, &c. By Michael Underwood, M.D., &c. in Three Volumes. 5th edition, London, 1805. *Suffocatio Stridula*, Volume i. p. 314, et seq.—Commentaries on some of the most important Diseases of Children. By John Clarke, M.D., &c. Part First. London, 1815, large 8vo. Chapter iv. On a peculiar Species of Convulsion in Infant Children, p. 86.—Observations on a peculiar Convulsive Disease affecting young Children, which may be termed Spasm of the Glottis. By H. Marsh, M.D., M. R. I. A. Dublin Hospital Reports, Vol. v. Dublin, 1830, p. 600. Denkwürdigkeiten in der Ärztlichen Praxis, von Dr Joh. Heinr. Kopp, Oberhofrath, u. s. w. 1 Bd. Frankfort, 1830. Über das Asthma Thymicum.—Etwas über eine besondere form von Asthma in kindlichen Alter; von Dr Franz Anton. Caspari, Stadtphysicus in Chemnitz Heidelberger Klinische Annalen, VII. Bandes 2 Heft. Heidelberg, 1831. S. 233—256. Beiträge zur näheren Erforschung des *Asthma Thymicum*; von Dr Pagenstecker, praktischen Ärzte in Elberfeld. In demselbe. S. 256—194.—Inaugural Abhandlung über das Asthma Thymicum, von F. Cornmaul; Zweibruchen (Deuxponts) 1834.—Ueber das Asthma Thymicum, von Dr Georg Hirsch in Königsberg. Journal der Practischen Heilkunde, von C. W. Hufeland and E. Osann, lxxxi. or lxxiv. Band. Berlin, 1835. 1 St Julius, Seite i.—Asthma Thymicum, von Dr Rosch, Unteramtsärzte zu Schwenningen von Königreich Wurtemberg. Ibid. lxxxii. or lxxv. Band. 1 St. Januar. Seite iii.—An Essay on the Laryngismus Stridulus or Croup-like Inspiration of Infants, &c. By Hugh Ley, M.D. London, 1836, 8vo.—On Laryngismus Stridulus or Spasm of the Glottis. By William Kerr, Surgeon, Paisley. Edin. Med. and Surg. Journal, Vol. xlix. p. 344. Edin. 1838.

THIS distemper, which is seen only in infants and children, consists in a sudden accession of difficult breathing, in which the child crows almost like a cock, during inspiration, which is rapid and accompanied with laborious motion of the larynx. Without any previous warning, except occasional, but slight breathlessness or wheezing, and often without that, the breathing is at once performed with violent and noisy inspirations, in each of which a sort of squeaking or crowing sound is heard. Meanwhile the eyes are glaring and fixed; the face is expressive of great distress; the head is thrown backwards, and the spine is bent, as in opisthotonos; the face and extremities, if the paroxysm continue any time, become bluish or purple; at length a forcible expiration ensues, followed by a fit of crying, and the child, after marks of great exhaustion, falls asleep.

The duration of the fit varies from a few minutes to 10 or 15 minutes. Several fits may take place in the course of one day. They often take place apparently when the infant is asleep, and when they take place during the day, it is chiefly after

straining, exercise, fretting, or being thwarted. In other instances, they come on without apparent cause.

Death may take place in the first fit; but this is not very common. Many fits succeed each other before the fatal event ensues.

Along with the symptoms now mentioned, it is very common, if not uniform, that the thumbs and fingers are forcibly and involuntarily inflected into the palms of the hand, and one or two toes, generally the large one and that next it, are, in like manner, forcibly inflected inwards towards the sole of the foot. These motions are evidently attended with feelings of pain; and any attempt to extend either the fingers or toes always causes pain and suffering.

In some instances the involuntary incurvation of the thumbs and toes comes on first, and continues a considerable time before giving rise to the crowing inspiration. In one case which I had occasion to treat, the thumbs and toes were inflected for weeks before a fit of spasmodic breathing took place; only one or two fits occurred, and they never returned; yet many weeks elapsed before the fingers and toes began to be extended.

This disorder may take place at any time between the third week after birth and eighteen months; but in the greatest number of cases it appears between the fourth and the tenth month. Dr Marsh relates a case which took place the third day after birth. It is seldom, if ever, seen after the expiration of the third year of infantile life. Mr Kerr, however, states that he has seen it in children above the age of three years.

The duration of the disease varies from three or four weeks to several months.

Dr Marsh, Dr Ley, and various other observers, represent this disorder as taking place chiefly in infants of strumous habit; and this must be regarded as a predisposing cause. Various other states of the system, nevertheless, may be placed in the same position. Thus dentition is often observed to act as a disposing cause; though the circumstance of the disease taking place so early as a few days, or three or four weeks after birth, shows clearly that the complaint may appear independent of this cause. In the cases that have fallen under my own observation, the alimentary canal has been always in a very disordered state, the motions have been extremely frequent and diarrhœal, of a grass green colour, as if the bile was not perfectly changed; and in one case the child presented all the symptoms ascribed to weaning-brash.

With regard to exciting causes, exposure to cold, excessive heat, a full meal, and the confined air of the nursery, have all been observed to be instrumental, at least in being followed by the appearance of fits.

MORBID ANATOMY AND PATHOLOGY.—In the bodies of infants destroyed by this complaint, very different and even opposite appearances have been found. Peter Frank observed long ago, that in infantile asthma the bronchial glands were unusually enlarged, and the thymus gland was much enlarged. Mr Alexander Hood long after found, in seven dissections of children, and two of adults, destroyed with symptoms of asthma, more or less enlargement of the thymus gland; and inferred that morbid enlargement of the same might be regarded as a cause adequate to produce asthmatic symptoms. In 1830, Dr J. H. Kopp brought forward the hypothesis, that the symptoms of crowing inspiration always depended on morbid enlargement of the thymus gland, and he accordingly applied to it the characteristic denomination of Thymic Asthma, (*Asthma Thymicum*.) This hypothesis was adopted and defended more or less strongly by Caspari, Pagenstecher, and Cornmaul, and afterwards by Dr Hirsch of Königsberg, but opposed by Dr Rosch of Schwenningen.

Dr Ley, who, from various cases, inferred that the only constant lesion was enlargement of the bronchial glands, ascribed the symptoms to that cause only. These glands when enlarged, he argues, will compress the pneumogastric nerve, and its recurrent branch the inferior laryngeal, while the superior laryngeal remains unaffected. As it is known that the muscles to which these former nerves are distributed open the glottis, while those to which the latter, the inferior laryngeal, are sent, shut the glottis, it follows that when the former are compressed the larynx must be suddenly closed, from the subversion of the antagonism of the two classes of muscles.

As the cause now mentioned, if efficient, ought to be constant in its operation, Dr Ley has been at great pains to show that it acts chiefly as the predisposing cause, while the excitement into which the infant is temporarily thrown by taking food, exposure to heat or excessive cold, or being thwarted, or the heated state of sleep, constitutes the exciting cause.

This idea is certainly plausible and ingenious; and it has the merit of being accurate as to the immediate exciting or proxi-

mate cause of the symptoms. It is impossible to doubt that these symptoms arise from spasmodic constriction of the glottis, or it may be paralytic constriction, in consequence of the muscles ceasing to act which detain the glottis in the open position. These muscles being as it were paralysed, those which shut the glottis immediately act; and the result is the crowing inspiration and the inability to breathe freely and easily.

The accuracy of the hypothesis which ascribes this paralysis to compression of the inferior laryngeal nerves, either by an unusually large state of the thymus gland or of the bronchial glands, is rendered both questionable and untenable by the facts, that the disease takes place in infants in which neither the thymus gland nor the bronchial glands are found enlarged, and that, in the cases which terminate favourably, it is not consistent with the hypothesis, to believe that the thymus gland or the bronchial glands are enlarged, because, if they were enlarged, the cause of the disease continues while the effect has ceased.

Regarding the hypothesis of enlargement of the thymus gland, it is indeed true that Dr Hirsch, in considering this objection, maintains that in one case only of all those inspected, viz. one by Pagenstecher, in which the symptoms took place, was the thymus gland found not enlarged. But to this I reply, that in this country, in several dissections of infants destroyed by the disease, this gland was found not larger than natural. In one case which I inspected myself with very great care, and in which I looked most particularly for morbid changes in the organs of respiration and their appendages, I found nothing but a little frothy mucus about the larynx, and the glottis, windpipe, lungs, and the thymus gland quite healthy; but in the intestinal tube a numerous series of invaginations, each of which was opposite to an enlarged patch of the aggregated glands. In another case inspected by a friend, the thymus gland was found equally free from morbid enlargement.

In short, if enlargement either of the bronchial glands or of the thymus gland were the efficient predisponent cause of this disorder, it would produce rather constant than occasional difficulty of breathing; and it would be almost unreasonable to expect a cure in such circumstances. It may turn out, nevertheless, upon further inquiry, that these enlargements are in some manner connected with the developement of the disorder.

From the collateral symptoms which have taken place in the cases seen by myself, and from the appearances found in the dead body, I am, on the other hand, disposed to regard this disorder as a spasmodic affection, induced by cerebro-spinal irritation as its immediate cause, and by disorder and irritation of the alimentary canal as its remote cause. The cases always present symptoms of irritation of the intestinal mucous membrane, and at the same time symptoms of irritation, either of the brain or of the spinal chord, or of both. My limits, however, do not allow me to illustrate this more fully.

TREATMENT.—Little can be done during the time of the fit. It may be expedient to use the warm-bath, to apply sinapisms to the extremities, and to administer purgative enemata; but little can be done to shorten the duration or mitigate the severity of the fit.

It is chiefly in the intervals that means must be adopted to prevent the fits from recurring. The bowels ought to be actively cleared out by calomel and chalk, or calomel and jalap, and castor oil. But, above all, attention must be given to the state of the brain and the spinal chord. Leeches should be applied to the temples or the occipital region, or along the spine; a sinapism along the course of the spine is often beneficial, and it is always useful to rub gently the spine with stimulating liniments.

In almost all instances it is requisite to attend to the state of the liver, and to inspect the motions daily.

Residence in the country, and free exposure to fresh air, are of great benefit; and after all marks of internal congestion have been removed, the use of the tepid and then of the cold bath will be advantageous. Clothing in flannel is indispensable.

§. IV. Suspended Animation. Apparent Death. *Mors Putativa*. [*Pseudothanatos*. *Asphyxia*. *Melanæma*, Goodwyn. Scheintod. Various forms of;—Smothering; Submersion; Strangulation; Suffocation. Death by Choke-Damp and Foul air.

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THE term Asphyxia (*Ἀσφύξια*) signifies literally loss, absence, or cessation of pulse; and in this sense it was used by Valsalva, Morgagni, Vogel, Sagar, and perhaps Linnæus, all of whom regarded it as the same with syncope, or as different from this affection in being more complete in degree, and more permanent in duration. Sauvages and Gaubius appear to have first thought of applying it, without reference to etymological import, to denote that state of apparent death or suspended animation, as it is sometimes termed, which ensues on the sudden interruption of the process of respiration; and in this they have been imitated by the majority of modern physiologists.

To limit the use of the term properly, two conditions are indispensable; *first*, that the first event in the phenomena of apparent death be interruption of the process of respiration; and, *secondly*, that this interruption be sudden and immediate. The first condition is requisite to distinguish asphyxia from apoplexy, in which the morbid phenomena commence in the brain, and from swooning, hemorrhagic syncope, and some cases of *angina pectoris*, in which they begin with the heart. Without the second it would be impossible to distinguish it from fatal cases of catarrh, croup, peripneumony, pleurisy, dropsy of the chest (*hydrothorax*), and several diseases or malformations of the heart, all of which produce death by causing slow and gradual interruption, and at length cessation of the function of the lungs.

After laying down these distinctions, it is unnecessary to make any observations on the error of Cullen, who referred asphyxia to the head of apoplexy; of Kite, who concluded that

it produced death in the same manner as this disease, (p. 69—75); of Le Gallois, who contends that decapitation kills by inducing asphyxia, (p. 30); or of Sauvages and others, who regard injuries of the spinal chord affecting the phrenic and intercostal nerves as causes of asphyxia. Injuries of the brain and spinal chord, as blows or wounds in the head, fracture of the cervical vertebræ, or diseases of these parts, as inflammation, effusion of blood, suppuration, &c. produce death, it is true, by suspending the action of the lungs. But this suspension is secondary and symptomatic; and upon the same ground almost every disease incident to the human body might be referred to the head of asphyxia. For these reasons, I admit those only to be instances of asphyxia, in which the phenomena commence distinctly and unequivocally with the action of the lungs.

The action of the lungs may be suspended or interrupted in different modes. Excluding those which arise from interruption of the action or influence of the brain or spinal chord, from suspension of the action of the heart, as in copious hemorrhage, rupture of the heart, rupture of the aorta, aneurism, &c. or from diseases of the lungs, the action of these organs may be suddenly suspended by any of the following causes.

I. Injuries done the chest, sufficient to impede or prevent the alternate motions of inspiration and expiration. Of this kind are sudden and violent compression of the chest and lungs, perforations of the chest admitting the air, or ruptures of the diaphragm, allowing the abdominal vertebra to be prolapsed and compress the lungs. Though these may be admitted to be legitimate causes of asphyxia, they are so little under the control of art that it is needless to bestow on them much consideration. The most important is that which occurs after wounds of the chest, and which has sometimes been known to follow the operation of puncture (*paracentesis*) of the thorax performed on the wrong side. The air rushing through the aperture in the cavity of the pleura compresses the only lung by which respiration is performed; and death is either very speedy or almost instantaneous. To this head, also, Bichat is inclined to refer the instances of immediate death after long and violent running, which, he thinks, has the effect of fatiguing the muscles of respiration till they are no longer able to contract. The state produced by this cause, however, is not so simple.

It is complicated with a considerable change in the circulation ; the blood being at once thrown, by the action of the muscles, too rapidly on the heart, and the pulmonary artery, by reason of the impaired state of respiration, being unable to receive it, even in ordinary quantity. It is worthy of remark, that in hares and other animals run to death, the heart is very often found ruptured.

II. Exclusion of the air, by preventing it from entering the lungs. This may be done in four modes ; 1st, by smothering ; 2d, by suffocation ; 3d, by submersion or drowning, and 4th, by strangulation.

1. Smothering is so well known as hardly to require definition. It consists in shutting up the mouth and nostrils by some soft body, so completely as to prevent the individual from inspiring or crying, with or without compression of the chest. Though it has not been enumerated among the modes of producing asphyxia, it is, nevertheless, the purest and least complicated example of the exclusion of air from the windpipe that can occur. In pure and simple smothering, as above limited, no injury is done the larynx or windpipe, as in suffocation and strangulation, nor does any fluid or other matter enter the windpipe, as in drowning ; and its effects ought therefore to be mere exclusion of air from the lungs. In actual occurrence, however, it is rarely so simple. In the most familiar accidental cases, that of overlaid infants, the chest or throat is generally more or less compressed. Of adults being smothered, the most ordinary case is that in which persons are buried under banks or mounds of earth, in the ruins of houses, or in the excavations of mines and quarries, or in the extensive commotions which take place in earthquakes ; and then there is invariably more or less compression of the thoracic walls, sometimes more complete than in the case of overlaid infants. In both cases, however, it is chiefly by exclusion of the air from the mouth and nostrils that asphyxia is produced, and by the continuance of this cause, that death is owing. The lungs are found to be emphysematous.

2. Suffocation consists in obstruction of the canal of the larynx or windpipe by a new growth, or by a foreign body. Of the first, the most common examples are swelling of the tonsils or uvula, or both, tumours of these parts, tumours of the epiglottis, laryngeal cartilages or windpipe, tumours of the œsophagus, or tumours of the base of the tongue. Any of these af-

fections may produce suffocation more or less speedily ; but this accident is most likely to happen in inflammation of the epiglottis or of the larynx. I have seen a patient in the latter disease, apparently convalescent and recovering from the urgent symptoms, expire in an instant. Death is then produced by the inflammation closing the *rima glottidis* so completely, as to prevent the air from passing through, especially if a little thickened mucus is present.

The most common mode, however, in which suffocation takes place is by some foreign body slipping into the windpipe. An abscess of the tonsils or of any of the contiguous parts may burst and discharge its matter into the windpipe. A collection of matter in the cavity of the pleura may burst into the bronchial tubes and windpipe. An aneurism of the carotid artery, innominata, or arch of the aorta may burst into the windpipe. In wounds of this tube, the blood may flow into it, and coagulating produce suffocation. Of this I saw an instance in the person of a man, who, in the attempt to commit suicide, had severed the larynx and upper part of the windpipe from the lower division. The blood from divided branches of the thyroid arteries flowed into the windpipe, in which it was found in the form of a tubular clot. Death was preceded by wheezing, laborious breathing, and other symptoms of suffocation. Croup has been also supposed to produce death by asphyxia, the false membrane or indurated albumen acting like a foreign body in obstructing the larynx and windpipe. Though this is true, it is not the full statement of the fact. The morbid process of croup consists in inflammation of the bronchial membrane ; (Cheyne, Section IV. see also Vol. i. Book II. Chap. ii. §. VIII. p. 799 ;) and though the false membrane were removed it would not save life. Lastly, portions of food or drink, especially the former, a bone, the stone of any fruit (Anacreon), a piece of money, a button, a leaden shot, or even a tooth may drop into the windpipe, and in the same manner be followed by speedy or immediate suffocation.

The mechanism of suffocation is easily understood. Any foreign body entering the windpipe is resisted powerfully and repeatedly at the top of that canal by the involuntary but forcible contractions of the muscles of the glottis, and the concurrent action of forcible expirations in the form of cough. When, however, by any means it has passed the situation of

the *rima*, these efforts at expulsion abate and cease, or return in paroxysms only, while the body, according to its shape, its size, and its consistence, more or less obstructs the canal and prevents the free ingress and egress of the air. A body sufficiently bulky to occupy the whole calibre or area of the canal will be followed by almost immediate suffocation, unless expelled by coughing. A heavy body, for instance, a bullet, a button, or a piece of money, adds to its bulk by its gravitation in resisting expulsion. An angular body like a bone may be firmly wedged between opposite sides of the canal, and resist all ordinary efforts at removal. If the body is neither sufficiently large to occlude the area of the canal, nor so small or light as to be readily expelled, it may not produce immediate asphyxia; but its presence is followed with so difficult and laborious breathing, and the inspired air requires so great efforts for its expiration that the mucous membrane may be ruptured, air may be forced into the submucous pulmonic tissue, and emphysematous swelling is produced. In some instances, the angular and irregular shape of the body may rupture the membrane with the same effect. In either case, the phenomena of partial suffocation are complicated with those of emphysema. (Desault. Bichat sur la Mort, p. 285.) (Mémoires de l'Académie de Chirurgie, *passim*).

To this head belongs the asphyxia of new-born infants. When an infant comes into the world still-born, it is first necessary to determine whether this cessation of the animal and vital powers is recent or is long-continued. The presence of heat and of some degree of motion in the navel-string will generally be sufficient to show that it is recent. It is then necessary to determine whether the cessation depends on injury done to the brain in passing through the passages, or in action of the heart, similar to the state of syncope, or in respiration not having taken place when the uterine life was ready to terminate, or had terminated. The first is not an uncommon cause of the still-birth; the second is rare; the third is, perhaps, the most frequent. The still-birth *asphyxia* has been by most pathologists and accoucheurs ascribed to debility or weakness of the muscles of inspiration, (Mauriceau, Sauvages;) and, perhaps, there are instances in which this debility may exist. In most instances, however, of new-born children not inspiring, it will be found, that the mouth and nostrils, the *fauces*,

and orifice of the windpipe, especially about the glottis, are plugged up by viscid mucus, or some of the fluids of the passages, which had been forced during the process of parturition into the mouth and nostrils, and thus excluded the air, and prevented respiration. This cause of suffocation was first pointed out by Portal, (p. 108,) who describes the mucus as so thick and viscid as to glue the tongue to the palate, fill up the nostrils, and obstruct the respiratory passages; and states that he found the windpipe in three still-born children plugged up by a cylinder of very compact mucous matter. The *Annales des Sciences et des Arts* for 1808, and the *Journal de Medecine Pratique*, contain a good case by M. Golfin, which he found to depend on this cause, and by the removal of which he succeeded in restoring life.

3. Submersion or drowning is an accident so well known as not to require definition. Asphyxia effected in this manner has at all times attracted much attention; and it is principally on the bodies of animals killed under water that physiologists have studied the phenomena and effects of asphyxia. From experiments of this kind, the following facts have been learned. When an animal is immersed under water, his pulse becomes weak and frequent, he feels an anxiety about his breast, and struggles to relieve it by rising to the surface of the water, when he throws out a quantity of air from the lungs, and makes several efforts to inspire. After this his anxiety increases; his pulse becomes weaker; the struggles are renewed with more violence. He again rises towards the surface, throws out more air from the lungs, and again makes efforts to inspire. In the course of these efforts, a quantity of water commonly enters the mouth, and meeting with the glottis, which it finds difficulty in passing, causes repeated gasping and choaking. His skin then becomes blue, particularly about the face and lips; his pulse flags, and gradually ceases; the sphincters are relaxed; he sinks without sensation and without motion; and a few air-bells escaping from the surface of the water, indicate the place where he sunk, and the last gasping expiration. These phenomena take place more or less speedily as the animal is able or unable to reach the surface of the water; according to strength, size, and age; and according to the temperature of the fluid. (Edwards.) If he rises repeatedly, asphyxia takes place slowly; if he is kept under water it supervenes speedily.

The following appearances are found in the dead body. The external surface of the brain is darker coloured than usual ; but the vessels are not turgid with blood, nor do they present marks of extravasation. The windpipe and bronchial tubes contain more or less frothy fluid ; and the pulmonary arteries are filled with black blood through their extent. The right auricle and ventricle of the heart are still contracting and dilating ; the left *sinus venosus* and auricle move feebly ; but the left ventricle is at rest. The right auricle and ventricle, and the left sinus and auricle are filled with black blood, but the left ventricle is only about half-filled with the blood of same colour, which is also found in the trunks and branches of the arteries proceeding from this ventricle.

Though the universal experience of mankind has no difficulty in believing drowning to be followed by insensibility and death, yet a good deal of controversy has existed among physicians as to the mode in which these effects take place, and the agents concerned in their production. In the infancy of physiological knowledge, it was supposed that the water proved fatal by rushing into the cavities of the body, and rupturing the organs essential to life. Afterwards, when the structure and functions of the animal body were better understood, it was imagined that death took place in consequence of water entering the lungs and interrupting respiration. This notion of the entrance of water into the windpipe was maintained and denied with more eagerness than was requisite, by the partizans of each side. The point is of no great moment ; for the entrance of water does not appear to be essential to the process of death by submersion. It may now be regarded as determined, that a small quantity of water, in some cases, enters the trachea, where it is afterwards found in the form of frothy mucus ; (Portal, 84, Goodwin, p. 19, Berger, Mayer,* Roesler†) ; but it is certain, that this is not the cause either of the symptoms of asphyxia, or of the death which ensues ; for a greater quantity of water than is generally found in drowned animals may be thrown into the trachea without causing either fatal or very bad symptoms ; and it is therefore inferred that the water acts indirectly by simply excluding the air from the lungs ; and this it does partly by preventing the entrance of fresh air, partly by the suc-

* Apud Hufeland's Journal der Practischen Heilkunde.

† Dissertatio Inauguralis, &c.

cessive expulsion of that which has served for respiration, and which is therefore vitiated; (Berger); so that in a person drowning, the lungs are gradually and successively deprived of air. Mayer, especially, concludes, that water in the form of froth is always found in the windpipe and air-tubes, when death results from mere drowning and not from apoplexy, epilepsy, or fainting.

This view, which seems correct, does away with the distinction made in 1790 by M. Desgranges of Lyons, who regarded drowning, in which no water enters the bronchial tubes, as a nervous form of asphyxia, quite distinct from that which results from suffocation with entrance of water. This distinction is doubtless important in a medico-legal sense, and may afford an explanation of those cases of submersion in which no water or frothy mucus is found in the windpipe, by ascribing them to apoplexy, epilepsy, or fainting. But, as it follows from this admission, that these cases are no longer examples of primary and genuine asphyxia, it is sufficient for the practitioner to be aware of the fact; but, at the same time, shows that they must be referred to another head; viz. that of death produced first by syncope and then by asphyxia.

This distinction was modified, first by M. Marc, who added asphyxia from cerebral congestion, and afterwards in 1828 by M. Leroy of Etiolles, who saw reason, from his experiments, to distinguish asphyxia by submersion into, *1st*, asphyxia from syncope; *2d*, asphyxia from defective oxygenation of blood without froth in the air-tubes; and, *3dly*, asphyxia from circulation of dark-coloured blood with froth in the air-passages. The propriety of the distinction of M. Desgranges, nevertheless, has been recently called in question by Dr Ogston of Aberdeen, who, from the appearances found in the inspection of six cases, infers that the distinction is not founded on the phenomena.

The question of the entrance of water into the windpipe or its exclusion from that tube, affords, however, no explanation of the mode in which submersion operates in producing death. The subject resolves itself into two points; the primary and the secondary effects of drowning. It may be concluded from various observations and experiments, that the primary operation of submersion is to exclude the air from the lungs, whether with or without the entrance of water into the air-passages. The secondary effect is much more important. When air is excluded, the motions of inspiration and expiration are neces-

sarily suspended. Not only are these mechanical motions suspended, but the chemical processes, which are at all times going on reciprocally between the air and the blood, necessarily cease.

The suspension of the mechanical motions consists in cessation of the motion of the diaphragm and intercostal muscles, and in the consequent quiescence of the lungs. At the same time the motion of the blood through these organs is first impeded, and afterwards suspended. If the opinions advanced by Dr Barry be well-founded, the motion of the venous blood must be very much retarded. But whether this be the case or not, there is no doubt that the blood in the pulmonary arteries flows with much less facility through these tubes, and finally stops entirely. In this circumstance is found the explanation of the fact remarked by Goodwin and most subsequent experimenters, that the right auricle and ventricle are invariably filled with black blood.

The cessation of the chemical changes consists in the blood of the pulmonary artery undergoing little or no change, and passing into the pulmonary veins and left side of the heart unaltered. Whatever be the nature of this change, it is well ascertained that it is essential to life; and that, unless arterial blood be supplied to the heart, and thence transmitted to the various organs, neither health can be maintained nor life can be prolonged. Goodwin, whose experiments were conducted with great accuracy, thought that he was justified in inferring that the presence of this black or unchanged blood in the left side of the heart and in the arterial system is the cause of the phenomena of asphyxia. Conceiving it demonstrated that the red blood of the pulmonary veins, or what is termed *arterial blood*, possesses properties, by virtue of which the contractions of the heart are excited, he argued, that, as in submersion, when the blood of the lungs is no longer arterialized, but comes unchanged into the pulmonary veins and to the left side of the heart, it was in this state unfit to excite the *sinus venosus* and auricle to contraction, they receive it into their cavity, and remain at rest. The heart then ceases to contract, and consequently ceases to propel blood into the organs. According to Goodwin, therefore, asphyxia depends on the unrespired blood destroying the energy of the heart, and preventing it from sending more blood to the brain and other parts of the system.

This doctrine was partly modified and partly corrected by

Kite and by Coleman. Mr Kite, in particular, from a numerous series of experiments, drew the conclusions ; 1st, that suspension of respiration does not induce stoppage in the circulation by chemically depriving the blood of those properties which it acquires in passing through the lungs ; 2d, that the lungs of drowned animals are in a state of complete expiration, and that only a small quantity of blood can pass to the left sinus and auricle ; and, 3d, that, as the suspension of respiration causes mechanical congestion of blood in the right side of the heart and in the lungs, it must produce death rather by inducing compression of the brain, or apoplexy.

Bichat took a view slightly different. Admitting the deleterious properties of dark or unrespired blood, and that the presence of this dark-coloured blood is essential to asphyxia, he contended that it is, nevertheless, capable of exciting the left or aortic ventricle, as well as the right or pulmonary. This unrespired blood, operates not on the heart only, but through the medium of the arterial system, on every organ, and, above all, on the brain, in which its presence is speedily demonstrated by loss of sensation, intellect, and motion, and eventually by reciprocal action on the heart and lungs.

The modena or unrespired blood, according to Bichat, acts on the heart and all other organs in precisely the same manner. Conveyed by the coronary arteries through the substance of the organ it penetrates between the muscular fibres, the force of which it remarkably impairs, and finally destroys. (Bichat, 203). But, at the same time, the same kind of blood is entering every muscle and organ of the body, and, above all, the substance of the brain, in which its contact produces an immediate atony or extinction of power. (225).

The proofs on which Bichat supported the truth of this opinion are, 1st, the effects of dark-coloured blood conveyed to the brain artificially, by making a communication between the jugular vein and carotid artery, or by injecting venous or unrespired blood through the artery, (223) ; and 2dly, the fact of the phenomena of asphyxia affecting the brain very soon after respiration is suspended, and, in cases of recovery of some affection of the brain, remaining after respiration is re-established.

Nysten again contends that this argument is inconclusive ; and that the injection practised by Bichat, instead of producing asphyxia, is followed by apoplexy ; for if dark-blood is gently injected into the carotid it does not prove fatal. Thus,

though he injected into the carotid artery various gases containing carbon, all of which, especially the gaseous oxide of carbon, give it a tint as brown as that of ordinary venous blood, yet it does not immediately destroy the action of the heart, but circulates for several minutes in the organs, and recovers in the lungs its animating properties. (*Recherches*, p. 161). Nysten, therefore, maintains, that the mere circumstance of dark-coloured blood reaching the organs is not sufficient to produce in them the process of asphyxia.

The idea, that, in the asphyxia of submersion, death takes place in consequence of unrespired blood poisoning all the organs, but especially the brain, continued, nevertheless, to be generally received without question or serious opposition.

In 1823, however, Dr Williams of Liverpool, in the course of experiments made on the chest and lungs, with the intention of ascertaining the merit of an hypothesis and practical proposal of Dr Carson, saw strong reason, not only to question the justice of the theory of Bichat, but to substitute in its place another, the soundness of which he conceived was almost unequivocally established by the phenomena of interrupted respiration, in whatever mode effected. The conclusions deduced by Dr Williams may be shortly stated in the following manner. *1st*, The passage of the blood through the lungs is obstructed on the suspension of respiration, while its circulation through the other parts of the body is continued. *2d*, This obstruction to the passage of the blood through the lungs is the effect, not of a mechanical cause, that is to say, collapse of the lungs or impediment within the vessels, but of deprivation of pure atmospheric air. *3d*, The blood found after death in the left auricle and ventricle, is the remnant after the last contraction and the subsequent draining of the pulmonary veins; and *4th*, the immediate cause of the cessation of the action of the heart is its being deprived of its natural stimulus, arising from the interruption of the movement of the blood through the lungs.

The peculiar circumstances in this theory of asphyxia, therefore, are the stoppage or cessation of the motion of the blood through the lungs, or rather through the pulmonary artery and the pulmonary capillaries, and the consequent cessation of the motion of the heart, not, as according to the other theories, because the blood was unrespired or deficient in chemical and consequent physiological qualities, but because it was deficient

in quantity,—because, in short, it ceased to flow through the pulmonary veins, and consequently because there was none to stimulate and maintain the action of the heart.

The essential circumstances of the theory now stated were prominently brought forward by Dr Kay, first in 1829, and afterwards, more fully, in 1834. Besides confirming the theory by experiments, Dr Kay further showed that venous or modena blood was adequate to maintain the action of the heart; that the essential cause of asphyxia was arrest or cessation of the motion of the blood, not only in the lungs, but also in the rest of the body. According to Dr Kay, cessation of the circulation follows that of respiration, in consequence of the exclusion of oxygen and the non-arterialization of the blood, because the minute pulmonary vessels, which naturally convey crimson or arterial blood, are filled with venous or modena blood, which they are unable to convey, and which, according to his views, must stagnate or cease to move through the lungs.

All these views are in some measure well-founded; but all of them are in one, if not two important circumstances, deficient. If the cause of the cessation of respiration and the pulmonary circulation consisted only in being deprived of atmospheric air, then it might be inferred that the constant supply of good atmospheric air alone, or its retention in the windpipe and bronchial tubes, ought to prevent the occurrence of asphyxia. The supply of atmospheric air, however, is of no avail, unless it be alternately inhaled and exhaled, in other words, unless the motions of the chest be continued to allow its alternate admission and expulsion. If the lungs be distended with the purest atmospheric air, and kept distended, that is, are prevented from collapsing and expelling the air, then asphyxia ensues as readily and certainly as under the vacuum of the air-pump.

It is, in short, not the mere privation of respirable air that induces the interruption to the function of respiration, but it is the occurrence of any circumstance which prevents the alternate admission of air into the lungs, and the issue of that fluid. This circumstance, which has been too much overlooked in all the theories on the nature of *asphyxia*, is connected with the fact, that it is requisite, not only to supply some principle to the lungs, in order to maintain the pulmonary circulation in a healthy state, but to withdraw from them some other principle; and whether this be carbon, as is maintained by some, or

carbonic acid, as is alleged by others, will not affect the real merits of the question.

The justice of these inferences is established by various facts; *first*, by the emphysematous state of the lungs in persons smothered; *secondly*, by the hurtful effects of insufflation, as demonstrated by the experiments of M. Leroy, which show that air is forced through the lungs into the pleura, and that even when moderate quantities of air are impelled into the lung, a gorged state of that organ is the result; and *thirdly*, by a case of partial asphyxia, related by Dr Roget, in which the usual symptoms were produced by accidentally fixing the chest by plaster of Paris, in the course of an attempt to make a cast. (Cyclopædia of Practical Medicine, article *Asphyxia*.)

4. Strangulation may be effected in various modes. The most simple consists in applying round the neck a cord or ligature, which is drawn so tight as to close the windpipe till respiration is stopped. This is the mode of death practised in the prisons of Venice, and by the bow-string of the Moslems over the whole Ottoman empire. Though the muscles, the blood-vessels, and the nerves are much contused, and the motion of the blood in the vessels is more or less completely arrested, so as to complicate the phenomena of asphyxia, with those of obstructed circulation, yet death is produced chiefly by the closure of the windpipe, the exclusion of atmospheric air, and the prevention of respiration.

A more complex mode of effecting the same purpose consists in suspending the body by the neck. Death in this case is not produced by the direct tightness of the cord. But the weight of the whole person, being thrown on a particular point of the cord, is made to gravitate against it in such a manner that the anterior and lateral parts of the neck are much compressed obliquely, while the posterior escape more or less completely. The effect of this mode of strangulation is not only to shut the windpipe, partly by direct compression, partly by twisting it, but to tear, bruise, and stretch all the parts of the neck so violently as to render the injury very complicated. Thus the base of the tongue is forced against the larynx and glottis; the cartilages of the larynx are in general much stretched, sometimes lacerated, (Valsalva, Morgagni); and the ligaments of the cervical vertebræ may be stretched or torn. The vertebræ have been said to be forcibly displaced, or even broken; (Sauvages, Portal, 304); but this is very rarely the case.

Besides these effects, if the body is weighty, or is made to drop much, the whole neck is stretched to such a degree, that not only are the diameters of all the blood-vessels contracted, but the muscles, nerves, ligaments, and soft parts in general are very much stretched or even ruptured, the *vertebræ* may be luxated, fractured, or displaced, and the spinal chord itself may be ruptured, or at least much disorganized. A singular, and I must at the same time, add, a very brutal method, of rendering this result quite certain, is occasionally practised on the continent by some accomplished executioners, who either leap on the shoulders, or lay hold of the legs of the criminal, and swing for some time in this manner, with the additional weight and force of their persons, so that if the drop be considerable, the *vertebræ* are either luxated or very much stretched, and the spinal chord ruptured or detached from the brain. At the Cape of Good Hope, under the Dutch Government, the executioner puts the culprit to death by leaping on the shoulders, and, though supported by his hands, continuing by a succession of leaps, in this position, to throw his whole weight on the trunk of the criminal until life is extinct. It is on popular authority asserted, that one London executioner was in the habit of dispatching the victims of public justice, by grasping the legs and swinging in this manner, till he was certain that death was complete.

The complicated nature of this injury has given rise to a keen controversy on the mode in which strangulation proves fatal. It has been supposed by one set of inquirers to induce apoplexy, and by another it has been imagined to operate by mere suffocation or exclusion of air by obstructing the windpipe. The ligature is conceived to operate in one of three modes; 1st, by compressing the nerves, the eighth pair, and great sympathetic; 2d, by compressing the blood-vessels, and causing such congestion of the brain as to induce fatal apoplexy; 3d, by obstructing the windpipe, and arresting the alternate motions of inspiration and expiration.

Though it cannot be denied that the pneumogastric and great sympathetic trunks undergo a degree of compression, and perhaps some contusion, yet their deep and sheltered position must contribute to protect them, and to render this injury comparatively trifling. The compression of the pneumogastric, which is most exposed, will operate chiefly on the glottis, (Le Gallois, p. 192, 194); the muscles of which are supplied by the recurrent branches with what are termed the inferior laryngeal

nerves. The sympathetic is so deeply situate that it can scarcely undergo any considerable compression, till the windpipe and blood-vessels are so squeezed as to extinguish life without other accessory means. The general conclusion must be, that the compression of the pneumogastric and great sympathetic trunks during strangulation, though not to be denied, is, however, neither essential to, nor to be regarded as, the chief part of the injury.

The compression of the blood-vessels has been with more plausibility adduced as a cause of apoplectic death in strangulation. When investigated, however, with any attention, the influence of this cause will appear to have been much exaggerated. Of the arteries the carotids only can undergo compression; for, from this agent, the vertebral are completely secure. It is known, however, that both carotids may be not only compressed but actually tied, (*Valsalva apud Morgagni*), without producing the symptoms either of apoplexy or of asphyxia, and certainly without anything like death. (*Haighton and Cooper.*) The compression of the jugular veins, therefore, is the only circumstance which can be admitted as of serious moment in tracing the direct effects of strangulation in the brain; and the appearances exhibited by the brains of persons killed by strangulation, and the symptoms manifested in those who, after partial strangulation, have been restored to life, show that this compression is not altogether without influence. The proofs adduced in favour of this opinion may be stated in the following manner. In the brains of persons and animals killed by strangulation, a great quantity of blood is accumulated in the vessels and in the ventricles, with or without serous fluid; and this vascular distension is much greater than in persons who have been drowned. (*Wepfer, Morgagni, Sauvages, Lieutaud, Kite, Portal, Kellie.*) Persons who have been partially hanged, and after being cut down, have recovered or been restored, have heaviness of the head, vertigo, impaired vision, and ringing in the ears, all which symptoms are removed by blood-letting. (*Morgagni, Sauvages.*) The latter relates that, in his time, a man employed in the revenues was hanged at Montpellier. The white penitents of the town, who counted this man among their brethren, speedily rescued him from the gibbet. As soon as the executioner left him, they conveyed him to their chapel, where they bled him three times in the course of about two hours. The pulse was imperceptible before the first blood-let-

ting; but it became distinct at the second, in proportion as the blood flowed. It was still very small, and beat scarcely 40 times in one minute. The man, restored to life, seated himself, and requested water in a very feeble and hoarse voice; he spit up some bloody expectoration, and eagerly drank a large quantity of water. His voice then became clear, his pulse became natural, and his breathing was always very tranquil, never hurried. Before drinking, he often struck with his foot the shell in which he had been placed, and these motions, which were involuntary, ceased as soon as he had drank. In a short time, the neck, on which the cord had made an impression the depth of an inch, swelled considerably; and none of the surgeons present daring to draw blood from the jugular vein, above the impression of the rope, the unfortunate man fell into a peaceful sleep, without his breathing becoming more laborious or more rapid; the pulse became gradually smaller and less frequent; and he died at length from accumulation of blood within the brain. Shortly before death the pulse beat scarcely 36 times in the minute, and it was very difficult to perceive the motions of respiration, which were feeble and unfrequent.*

A similar case, though more pointed, is given by Mr Kite (at p. 204,) in a middle-aged man, who attempted to destroy himself by suspension. He was cut down in five minutes after. When Mr Kite saw him about an hour and a half after, he presented all the symptoms of deep and strongly marked apoplectic seizure. Death ensued in the course of four hours. The vessels of the brain and its membranes were found loaded with blood. †

From cases such as these, both Mr Kite, Mahon, and Foderé, have drawn the conclusion, that in suspension by the neck all the vessels above the ligature are unusually distended, and that by the excessive accumulation the brain is oppressed.

Against this opinion, however, the following facts and arguments may be adduced.

The unusual accumulation of blood and even serum in the cerebral vessels is to be ascribed, not merely to direct compression of the jugular vein, but to the difficulty which the blood experiences in returning through these veins to the lungs, in consequence of the suspension of respiration.

* Nosolog. i. p. 679, and Mahon, *Medecine Legale*, Tome iii. p. 60 and 64.

† An Essay on the Recovery of the apparently Dead, p. 204.

The morbid sensations referred to the head occur not only in recovering from partial strangulation, but in recovering from drowning, from suffocation with charcoal vapour, and other causes of asphyxia.

In suspension by the neck, the jugular veins of one side only are so much compressed as to impede sensibly the return of the blood toward the lungs. Those of the opposite side, on which the cord ascends by the ear, are scarcely at all compressed.

The jugular veins may be tied in a living animal without inducing apoplectic symptoms or asphyxia. (De Jean apud Portal, 302.)

In an animal suspended by the neck, if an opening be made through the trachea below the cord, so as to admit air freely into its interior, though the animal struggles, he neither shows symptoms of asphyxia nor of apoplexy. (Kite, 126.)

Lastly, If the trachea of a living animal be insulated from the contiguous parts, and a cord inserted so as to include the whole neck except the windpipe, the animal may be suspended for hours, (from two to three,) without being killed; and when death takes place it appears to be the result of his violent exertions. (Kite, 127.) Conversely, if the trachea only be enclosed in a ligature, death takes place as rapidly as in mere strangulation. (Coleman, 111.) In such instances the veins of the head are said to be less distended than natural. (Ibid. 138.)

From these several facts it may be justly inferred, that, whatever be the influence of the ligature in strangulation in impeding the return of the blood by the jugular veins, and thereby inducing apoplectic congestion, this is never sufficient to prove fatal, and that the genuine cause of death in strangulation is interrupted respiration in consequence of closure of the windpipe.

III. Exclusion of atmospheric air, by presenting to the lungs a gaseous medium unfit for the purposes of respiration.

Chemistry shows that for healthy respiration an atmosphere consisting of about 20 parts of oxygen, and 79 or 80 of nitrogen, with a trace of carbonic acid, is indispensable. If the proportion of these ingredients be much altered, respiration becomes more or less difficult, or may be suspended, or even entirely arrested with fatal effects. Though the air is so constituted, that whatever changes may be induced in its composition

are quickly rendered harmless by the rapid and incessant interchange of its parts, yet there are situations, the local peculiarities of which may render this circulation so slow and uncertain, that a local vitiation of the air is not uncommon. The sources of these local vitiations are various, and have been examined with much care, and subdivided with great minuteness by chemical inquirers. Though these arrangements are highly philosophical in a chemical point of view, it appears more suitable for the purposes of the medical reader to arrange them in the following order.

1. Air which has served for respiration or combustion, or for both. This may be viewed as the first and the simplest change to which atmospheric air is liable. In consequence of respiration the oxygen partially disappears; its place is supplied by carbonic acid gas; and the azote remains unchanged. An atmosphere of this kind, therefore, contains a large proportion of azote and carbonic acid, and little or no oxygen. Its effects are highly deleterious, as is shown by confining animals in a given quantity of atmospheric air. Thus, Berger found that a cat, 10 inches long, confined in a glass globe containing 272 cubic inches of air, was completely asphyxiated at the end of 18 minutes. During experiments of this kind, the air is said to undergo a reduction of from 22 to 13 per cent. of oxygen gas, or to lose about 9 per cent., and to acquire a quantity of carbonic acid of from 7 to 12 per cent. In the experiments of Allen and Pepys, a person respired a given quantity of air till he became insensible, when the residual oxygen was found to contain in the 100, 10 parts of carbonic acid, 4 of oxygen, and 86 of azote. It appears, therefore, that in asphyxia by breathing an unrenewed atmosphere, it is not requisite that the oxygen should disappear entirely; and that living beings become quite insensible, and show all the symptoms of perfect asphyxia, when there is still some oxygen left. It follows, therefore, that the deleterious influence is to be ascribed not merely to the privation of oxygen, but to the presence of an unusual quantity of azote and carbonic acid.

One of the best examples of suffocation or asphyxia produced in this manner is presented by the history of the dreadful and sudden mortality caused by the Black Hole of Calcutta. In the month of May 1756, 146 persons of both sexes were shut up in a prison, consisting of a cube of 18 feet, walled on

the east and south, the only quarters from which supplies of fresh air could be expected, and open on the west by two windows strongly barred with iron, through which no circulation of air was perceptible. In this situation, these persons remained from evening till day-break, when, on opening the door, it was found that 123 had been suffocated during the night. Mr Holwell himself, when brought out, was in a state of insensibility; but exposure to fresh air restored him to consciousness. (Narrative of the Sufferings, &c. by Mr Holwell.)

The operation of an unrenewed atmosphere is to be understood by considering the effects of azote and carbonic acid gas when respired.

The former is thought to operate indirectly by simple privation of oxygen gas. An animal immersed in an atmosphere of pure or nearly pure azote, instantly experiences great constraint in breathing, which becomes loud, laboured, and more rapid than usual. He then gradually loses strength, though without symptoms of injury of the nervous function. (Dupuytren.) After death, the arterial system is found filled with dark-coloured blood, indicating the suspension of respiration. The fact of young animals asphyxiated by this gas being restored to life by exposure to fresh air, shows that it operates not by virtue of any directly deleterious property, but chiefly by excluding air, and preventing the requisite changes in the blood from being accomplished. When injected into the veins, it is partly dissolved in the venous blood, and prevents the blood, while circulating through the lungs, from recovering the vermilion tint proper to arterial blood. (Nysten, p. 70.)

The effects of carbonic acid gas are very similar. Experiments show it to be not directly noxious, but hurtful only by excluding the atmospheric air.

To the same head, perhaps, should be referred the foul air found in old pits and caverns, in tombs, and in the wells and holds of ships. (Blane.) In such situations, where the air, being long shut up, has been prevented from interchange with the external atmosphere, the oxygen appears to be converted gradually into carbonic acid gas, when the contained air consists chiefly of this and nitrogen. Accidents from entering into places of this kind are frequent and well known.

The air in the dog's cavern, (*grotto del Cane*,) near Naples, consists of carbonic acid gas, which issues from the crevices of its limestone basis.

2. The gas of fermenting processes, which is well known to be a frequent cause of asphyxia, consists chiefly of carbonic acid; and they afford almost the only instance in which this gas is presented alone and in a state of purity to the lungs. Thus, a person attempting to enter a beer vat, or tun of fermenting must, is seized instantly with loss of sense and motion, and falls down lifeless. (Felix Platerus, *Observat.* p. 18.) (Peter Borelli, *Obs.* 4, cent. 2,) (de Meyserey, *Tom.* i. p. 103.)

3. The combustion of charcoal in choffers is attended with the extrication of vapours which are highly deleterious to the organs of respiration. These vapours consist of carbonic oxide, carbonic acid gas, and a little carburetted hydrogen. (Orfila.) Examples of asphyxia from this source, which have been frequently observed, are recorded by Marcellus Donatus, (*Lib.* iv.); Felix Plater; M. De Meyserey, (*De la Vapeur de Charbon et de la Braise*, *Tome* i. p. 92); Vetillart, (*Journal de Medecine*, *Tome* xxii. p. 514); Portal, Baron Larrey, (*Tome* iii. p. 13); (*Asphyxie des Chambres echauffées par les poeles de fonte*); Babington, *Medico-Chirurgical Transactions*, Vol. i.) The case given by Mr Tossach, (*Edin. Med. Essays*, Vol. v. Art. lv.) of asphyxia from the vapour of a burning coal-pit is probably to be referred to this head; and there is strong reason to believe that the accident which happened at the Leadhill mines in 1817, and of which an account is given by Mr Braid in the 13th volume of the *Einburgh Medical and Surgical Journal*, though ascribed by him to sulphurous acid gas, was occasioned by the mixture of carbonic acid and carbonic oxide. It is remarked particularly that the men were, without exception, frantic, or had the appearance of intoxication—an effect which Bichat justly remarks often results from the charcoal-vapour. (*La Vapeur du Charbon enivre souvent*, 289.) Of the same kind are the accidents resulting from the patent stove of Joyce.

The symptoms vary according to the mode in which the foul air is breathed. In the ordinary way, the individual sits down or goes to bed in an apartment containing a choffer or brazier of burning charcoal. At first he feels little or no inconvenience; but as the apartment begins to be filled with the vapours disengaged during combustion, he becomes, if still awake, listless, languid, and drowsy. This condition is soon followed by a state of apparent sleep, in which, however, respiration is either very languid or ceases entirely. No commotions of the muscular system are observed, but every feature is calm

and placid, every limb at rest; and the attitude of the person that of perfect composure; and, though the heat of the body continues, the pulse is entirely gone at the wrist, and, perhaps, a languid flutter only is perceived at the heart.

When, on the other hand, a person enters an apartment, the air of which is much loaded with charcoal vapour, he feels at first, weight in the head, tingling of the ears, derangement of vision, which is sometimes double, much inclination to sleep or lay down, and sometimes a pleasant sensation of listlessness and indifference, which leads him to delay till it is too late to escape. In other instances, sudden and violent pain of the head, constraint in breathing, are followed by instant loss of consciousness and motion; the individual staggers like a drunk person, and falls down motionless, and, to all appearance, lifeless.

The instantaneous effect in this case depends on the great abundance of a gaseous body which immediately interrupts the process of respiration. Pure carbonic acid gas is highly deleterious; for animals immersed in it perish in two minutes. (Hallé.) It is generally supposed to operate by mere exclusion of the air, (Nysten); for though when injected into the carotid artery, it gives the blood a brownish tint, yet in small quantity it causes no remarkable symptom; nor in large proportion is it followed by any pulmonary injury. This, however, is doubtful; for various facts tend to show that pure carbonic acid gas irritates violently. (Collard de Martigny, *Archives Gen. de Med.* Juin 1827.)

Similar accidents have been known to happen in the vicinity of lime-kilns. "In the month of April 1806, a family of seven individuals were suffocated at Marseilles beyond the Barrier of St Victor, by the vapour of a kiln in which lime was clandestinely burnt in the court, from which the vapour entered by the doors and windows. Of the seven persons five perished and only two were saved. All of them attempted to escape death by flight; and as the accident happened during the night, some were found on the stair and on the threshold, with a lamp in the hand in the attitude of fleeing; but the fatal influence of the lime-kiln vapour rendered them utterly unable." This vapour is regarded by Foderé, (*Tome iv. p. 37,*) from whom this case is taken, as carbonic acid gas; but as lime is invariably burnt either with charcoal or wood, as in France,

or with pit-coal and wood, as in this country, it can scarcely be doubted that a portion of carbonic oxide, and perhaps of carburetted hydrogen, is also formed with the carbonic acid. The last substance must evidently be most abundant, as its evolution from the lime is the great object of the process of burning.

The effects which this vapour produces on the animal body are to be ascribed not merely to the presence of carbonic acid. The carbonic oxide has a peculiar and considerable influence, which is to be understood by knowing its operation on the pulmonary and general circulation. The experiments of Nysten lead to the conclusion, that though it communicates a brown colour to the arterial blood, it may be injected in large quantity without causing pulmonary injury; that it is not directly deleterious, but operates chiefly in interrupting the chemical phenomena of respiration, in consequence of the want of the necessary principle or element. These statements may be accurate when applied to carbonic oxide if respired alone. In ordinary circumstances, however, it is always more or less diluted with atmospheric air. It is therefore taken into the lungs, and probably absorbed by the blood in the capillary system of these organs, from which it is conveyed to the various regions of the body in the ordinary course of the circulation. (Bichat, 282.) When charcoal vapour is respired in such small quantity as not to cause immediate asphyxia, its presence in the system is followed with a sense of weight and dulness of the head and eyes, and some tendency to stupor, which lasts for a day or two according to circumstances; and these phenomena are in all probability to be ascribed to the presence of carbonic oxide in the vessels of the brain.

The other ingredient of this vapour, carburetted hydrogen, appears to operate indirectly by excluding the air and preventing the chemical phenomena of respiration. Though it gives the blood a brown colour like carbonic oxide, its presence is followed by no injury to the functions of the lungs (Nysten, 154); and all that can be imputed to its agency is the defect of the principle necessary to respiration.

2. The gaseous substances hitherto enumerated as causes of asphyxia are thought to operate rather in a negative or indirect than in a direct manner; and are chiefly remarkable for being followed after being inspired with sedative effects. Another class of gases remarkable for displaying conspicuous pro-

perties of local irritation, still claim some consideration as asphyxiating agents.

The first to be noticed is the vapour extricated from *aqua-fortis*, or nitrous gas, and which, the moment it meets the atmosphere by combining with its oxygen, is instantly converted into nitrous acid gas. The fatal effects of inhaling this vapour are forcibly demonstrated in the account of an accident which occurred to a dealer in *aqua-fortis*, related by M. Desgranges, (Journal de Medecine, Tome viii. p. 487.) This person being awakened one morning (in May 1804,) by the howlings of a large watch-dog confined in his store-house, had no sooner entered the place than he felt a strong nitrous smell, the origin of which he could not doubt, when the dog rushed precipitately out with its paws burnt, to quench them in the nearest stream. He scarcely remained five minutes for the purpose of opening the windows, when he was obliged to withdraw under the urgent dread of suffocation. He shortly after returned in order to get the box containing the broken vessels; but even in this short time the operation of the vapour upon the mucous surfaces of the respiratory and gastric organs, was sufficient to render all means of art unavailing. At six, only two hours after the accident, having taken some milk with a quantity of wine, he walked about the town, but returned complaining of great weakness, dry smarting heat in the throat, and a sense of constriction in the epigastric region. Having taken nothing but milk, he had a spontaneous stool about one hour after noon, and, in the course of an hour, two others of a citron yellow colour. At four, he began to expectorate yellowish matter, the appearance of which gave some hope; in the evening he had cough, some squeamishness, and slight vomiting; and the urine, which had been scanty, was now the cause of frequent but vain efforts to void it. Glysters administered were instantly returned tinged yellow. At nine, the surface became bluish; the chest was oppressed, and there was some rattling; there were occasional hiccups, and great pains were felt in the region of the diaphragm; and there were some convulsions and slight delirium. Towards morning the anxiety increased, the anguish became unutterable, consciousness was gone about five or six, when milk was still taken, and death took place at seven in the morning. Shortly after death the belly swelled and became remarkably tympanitic; the countenance became

purple, the lips black, and several drops of blood trickled from the nostrils and mouth. The body was not opened.

This history affords an example of the irritating effects of nitrous acid gas applied to the bronchial mucous membrane. Perhaps in strict language it is rather a case of acute inflammation than of asphyxia; for Orfila admits, that it operates by, *1st*, irritating violently the bronchial tubes and the small pulmonary vessels; and *2dly*, by giving the blood a brown colour. As, however, the first of these effects seems to depend more on its action being too temporary to produce the proper effects, and it cannot be doubted that, if applied sufficiently long, it will induce the usual phenomena of suspended respiration, there is still sufficient reason for placing it here as a cause of asphyxia.

The next vapour of this description deserving notice, is that extricated during the combustion of substances containing sulphur, in places where free circulation is prevented. The most ordinary source of this vapour, which is sulphurous acid gas, is pyritic coals, or other substances containing pyritic minerals. It may be doubted if any correct records have yet been given of any accident originating from this source; for most of the cases of suffocation, vulgarly ascribed to sulphury coals, are manifestly the result of suffocation by carbonic oxide; and even the case related by Mr Braid is not free from this objection. It is, therefore, impossible to give a satisfactory account of the peculiar symptoms and effects which result from its inhalation. There is little doubt, however, that the sulphurous vapour is quite competent to produce immediate asphyxia; that if pure it irritates so violently as to be incapable of being inhaled; and that if mixed even with a large dose of atmospheric air, it is sufficient to provoke violent and repeated coughing.

A very deleterious vapour yet to be noticed is that which is disengaged from animal matters, especially human excrement, during the spontaneous changes which they undergo when left to decompose in great quantities. The mode in which substances of this sort are suffered to remain in the pits of latrines and necessaries, especially in Paris, is a frequent source of vapours and gases which are highly and promptly deleterious to the workmen and other persons engaged in keeping them in repair and order. (*Le Mephitisme des Fosses d'Aisance.*) The noxious influence of this vapour or vapours is violent and im-

mediate, or moderate and slow, according to circumstances. Though simple exposure to the vapours of the matter, when put in motion for the purpose of removal, is sufficient to induce asphyxia, yet this is neither the most uniform nor the most severe case of the affection. The researches both of Laborie, Cadet and Parmentier, of Hallé, and of Dupuytren, show that the most dreadful and irresistible cases of asphyxia take place in pits which have been cleansed, and in which the noxious vapour is allowed to escape by the removal of one or more stones, either from the flooring or the side-walls of the pit.

When a workman descends into such a pit he is either immediately struck with complete insensibility (*le plomb*), which is speedily followed by real death; or he gasps convulsively, utters a single shriek, reels like a drunk person attempting to dance, and falls down without motion or consciousness, with the usual signs of suspended animation. In the former case, respiration has received a sudden and violent check; the action of the heart has ceased; and though some heat remains, life is irreparably extinguished. In the latter, though consciousness, sense, and motion are gone, the lips violet, the face livid, and the mouth foaming with bloody froth; though the eyes are dull and lifeless, and the pupil dilated and immovable; yet the irregular and tumultuous beats of the heart, a short difficult and convulsive heaving of the chest, and a small frequent pulse at the extremities, with a cold dew on the forehead, indicate still the remains of life in the system. When the person with such symptoms is removed into the open air, his efforts at breathing become more distinct and violent; the beating of the heart becomes more regular and full; and, in some instances, a convulsive heaving of the diaphragm and abdominal muscles is the precursor either of retching or discharges of fetid air from the stomach and bowels.

These symptoms are the effect of the inhalation of hydrosulphurous acid gas (sulphuretted hydrogen), which is the chief and most uniform constituent of the mephitic vapour of the latrines. Besides this, indeed, the vapour is said to contain some azote, some hydrosulphuret of ammonia, and some free ammoniacal gas, the irritating power of which is the cause of an inflammatory affection of the eyes, incident to persons employed about these pits, among whom it is known by the name of *la mitte*. There is no doubt, however, that it is to the presence

of sulphuretted hydrogen in considerable quantity that the peculiar phenomena of this form of asphyxia are to be ascribed.

The noxious properties of sulphuretted hydrogen have been ascertained experimentally by Chaussier, Dupuytren, and Nysten. According to the experiments of MM. Dupuytren and Thenard, air containing a $\frac{1}{800}$ th part of this gas kills a bird very speedily, and it is only when the proportion is reduced to $\frac{1}{1000}$, that it does not prove fatal, and that its effects are limited to constraint in breathing. In an atmosphere containing $\frac{1}{800}$ part a small dog perishes; in one of $\frac{1}{300}$ a dog of moderate size; and a large strong animal is suffocated in air containing a $\frac{1}{100}$ part of the gas. This is more than was requisite to kill a horse, which perished in an atmosphere containing a $\frac{1}{250}$ th part.

The effects of this vapour on the animal tissues and solids are represented by Chaussier as the following. The blood is thickened and rendered black. The bronchial and nasal mucous membranes are covered with a viscid brownish mucus. The muscles are blackish and void of their usual contractility. All the softs parts, deprived of their natural tenacity, are torn with extreme facility, and pass speedily into putrefaction. These facts, which have been verified by Orfila, show that sulphuretted hydrogen, when inhaled into the lungs, even in a small dose, operates not only as a local irritant, but, being absorbed into the vascular system, produces on the blood and on all the tissues of the body specific changes, quite incompatible with the continuance of life. In confirmation of this view, it may also be stated, that the same effects result from the injection of the gas into the stomach or intestines, into the cellular tissue (Chaussier), or into the blood-vessels. (Nysten).

So deleterious is this vapour, that a person affected with asphyxia from its inhalation may, by communication, cause the same accident to a by-stander. (Hallé, Bichat). When it does not cause immediate death, it irritates the pulmonary and gastro-enteric mucous membranes very remarkably; and after death the traces of this irritation are found in the increased weight, density, and injection of the lung, redness of its bronchial membrane, in the formation of a false membrane, in the tracheo-bronchial cavity (Dupuytren), and in redness, or greenish-red spots of the intestinal canal. The viscera in general exhale a distinct odour of putrid fish; and even the by-standers and assistants who are exposed to the emanations from

them are not unfrequently affected with lassitude, stupor, drowsiness, and colicky pains. (*Nouveau Journal de Medecine, &c. Tome i. 1818.*)

Writers on toxicology have enumerated as causes of asphyxia the inhalation of other gaseous bodies; for example, pure hydrogen, the protoxide of azote or exhilarating gas, and chlorine gas. The first is a cause of asphyxia in artificial instances only, and therefore is merely to be mentioned in this place. The second can scarcely be regarded as a means of suffocation, and is with more propriety to be viewed as an intoxicating or stimulating agent, the excessive effects of which produce syncope or stupor. (Davy, Orfila, and Pfaff). Chlorine gas has an operation entirely different from any of the asphyxiating vapours, and possesses high powers of local irritation. When respired pure, it is not absorbed, but it produces in the bronchi a local irritation, which is so violent that the animal dies before the proper symptoms of asphyxia from black or unrespired blood have taken place. (Nysten). Another proof of its action being that of an irritant solely is, that when it is breathed diluted with air, and in too small quantity to destroy the life of the lungs, its action is confined to the formation of cough more or less severe, and sometimes, as Fourcroy remarks, to inflammation of the bronchial mucous membrane. (Nysten.) In this respect it is not unlike sulphuretted hydrogen gas.

The mode in which these several vapours, when inhaled, operate, must be perceived from what has been already said. It is neither altogether by preventing the access of good atmospheric air, nor by being absorbed by the lungs, but in both ways conjointly, that their noxious influence produces its effects. Thus pure azote or pure hydrogen equally exclude the atmosphere, and thereby prevent the usual operation of this agent or the pulmonary circulation. But, in general, after they have been for some time inhaled, they can be distinctly shown to be absorbed, and conveyed into the circulation. It was at one time supposed that the acid gases, as carbonic, nitrous, sulphurous acid, and sulphuretted hydrogen, were not absorbed; but the experiments of Nysten show that this conclusion is erroneous, in reference to the three latter; and it is extremely doubtful if the absorption of carbonic acid is denied on better grounds. In short, the general conclusion in the present state of the question must be, that though these gaseous bodies certainly pre-

vent the lungs from receiving the full dose of pure air, yet they are also taken into the circulation, and by their chemical or physical properties effect peculiar changes in the blood, and in the organs to which it is distributed. It is chiefly in the former sense, that of excluding air, that the noxious gases can be said to be agents of asphyxia. In the latter they are to be viewed in the light of direct poisons.

THERAPEUTICS.—The treatment suited to the particular varieties of asphyxia will be understood from the observations already made on their physiological peculiarities.

In the first sort, those from mechanical injury of the walls of the chest, mechanical means are also to be employed as remedies. They are rarely much under the influence of art; and death takes place so suddenly as to render most efforts unavailing. When air has been allowed to penetrate into the cavity of the pleura, its extraction by the syringe ought to be attempted.

In the varieties of the second sort, the remedial means must be adapted to the peculiar cause by which the asphyxia is produced.

In asphyxia from smothering, so much time elapses from the date of the injury, and the injury itself is so complicated, that it is rarely possible to employ any means of resuscitation with the hope of success. If the body is still warm, if the marks of contusion are slight, and if the collateral circumstances show that the smothering is recent, attempts at restoration should be made by clearing the nostrils and mouth, impelling air into the windpipe by the former, exciting the motion of the diaphragm and abdominal muscles by alternate compression and friction; and, if these fail, an opening should be made into the windpipe in the usual manner, and air introduced so as to inflate the lungs.

In asphyxia from suffocation, the first object is the removal of the foreign body. When this consists of fluids, as blood, purulent matter, &c. if it is not expelled by coughing, it is rarely removable by other means; and a fatal result is too likely to ensue. If it is a portion of food, a bone, a piece of money, or other solid substance, extraction must be attempted in the usual way by the forceps; and if this fails, or is inexpedient, it ought to be attempted by an opening in the windpipe, which is further immediately necessary to prevent instant suffocation.

In the still-born asphyxia, inflation of the windpipe by the nostrils is in general sufficient to rouse respiration, after which the mucus is gradually expelled by coughing. It is, however, proper to remove as much of this as may be accessible, from the mouth and throat, by the finger, probe, and forceps, enveloped in soft cloths. A feather with stiff awns is sometimes used with advantage. Embrocations with spirits and ammonia externally are also useful; but the application of the latter stimulant to the nostrils or mouth is not free from danger. (Orfila.)

In asphyxia from drowning, recovery will depend on the time the body has remained under water, and on the degree of heat which the body retains about the epigastric region. The great object is to excite the action of the lungs, first by inflating them, and secondly, by stimulating the several muscles which are concerned in the motions of the chest. With this view air should be impelled through a tube introduced into the nostrils, either by bellows or the mouth of the operator, into the lungs of the drowned person; while attempts are made, by alternate compression and elevation of the chest and belly, to excite the motions of the diaphragm and intercostal and abdominal muscles. If inflation fails in exciting respiration tracheotomy should be performed, and air introduced by the incision.

It must be remembered, nevertheless, that inflation, at least when forcibly performed, is by no means a measure altogether void of danger. Though recommended strongly by many eminent physiologists, and by the whole of the societies who have undertaken to give directions for the recovery of the recently drowned, and though practical illustrations of its alleged beneficial effects have been adduced by Portal, Johnson, Troja, and many other authors, it is a measure which must always be employed gently and cautiously, and never without the knowledge that it may be hurtful. M. Leroy has shown by experiments on the lower animals, that forcible insufflation may rupture the lungs, and impel air into the cavity of the lacerated pleura. It is remarkable also, that, if we trust to the Reports of the Humane Society of London, and the statements of M. Pia, the superintendant of the analogous establishment in Paris, but a small number of drowned persons have been restored to life, since the practice of inflation was in general use. M. Leroy regards

inflation as useless or rather dangerous in the variety of asphyxia in which drowning is preceded by syncope, and inadmissible in those forms of the accident in which there is simply dark-coloured blood in the organs. It is only when there is froth in the windpipe, and where there is reason to believe that most, if not all, the air has been expelled from the lungs, that inflation may be cautiously practised; and in that case only along with alternate motion of the ribs and diaphragm. (*Journal de Physiologie Experimentale*, T. viii. p. 121, &c.)

The other means, though accessory, should not be neglected. These consist in the application of warmth, by bath, hot water, hot frictions, and in the employment of certain agents which are supposed to exercise a stimulant effect. The body should be placed in the sun, if the weather is warm, or before a fire in a moderately warm apartment, if the air is still cold. The warm bath is sometimes used with good effect; and embrocations, with warm spirituous lotions, as tincture of camphor, spirits, and ammonia, or spirits and vinegar, should be employed vigorously, if a bath is not ready. Gentle and equable warmth may be also applied by water in bladders, or in bottles, and by hot bricks rolled in flannel. The tobacco injection has been much commended; but its operation is ambiguous. A glyster, containing a quantity of warm oil of turpentine, at 97° Fah. would be in all cases much safer.

At the same time, all shaking of the body, or holding it by the heels, for the purpose of allowing the supposed water to flow out, or laying it over casks, should be prevented; for these rough measures are sufficient to extinguish any remaining or returning sparks of life. Even the practice of pouring cordials or warm fluids into the mouth is not free from risk, until respiration and the power of swallowing is completely re-established; for a small quantity of fluid may, by slipping into the windpipe, destroy all the advantage gained.

Blood-letting has been proposed in theory, and is said to have been beneficial in practice. It may safely be said, that it has no influence in restoring respiration or animation, when completely suspended; and the cases in which it has been used would have recovered without its use. In one stage of the affection, however, it may be not only useful but necessary; and this is after respiration has been restored; if the circulation seems languid, and the brain appears still to labour under the

influence of a sluggish current or a stagnant mass of unrespired blood. In such circumstances, a few ounces removed from the veins may facilitate the motion of the rest, and enable the lungs to arterialize more easily the small quantity which remains. Galvanism and electricity applied to the region of the heart have been much recommended ; but, without artificial respiration, they are ineffectual, and with it they are superfluous or dangerous.

In asphyxia from strangulation death is generally so complete as to render all efforts at recovery abortive. In that from suspension, the principal remedy, after cutting down the body, and removing the cord or ligature from the neck, is inflation of the lungs ; and as many persons have recovered even without this, the chance of success is not inconsiderable. If inflation by the nostrils, or with a tube in the windpipe, appears to be unavailing, there is reason to believe that the larynx has been so compressed as to prevent the air from reaching the bronchial tubes ; and inflation by an opening in the windpipe should be attempted. If this also fails to restore respiration, there is reason to believe that life is extinct. Blood-letting has been employed in this form of asphyxia ; but it is chiefly useful after respiration is re-established, and while the brain seems loaded, and the circulation sluggish.

In asphyxia from breathing any of the noxious gases, the great remedy is pure air ; but some peculiarities deserve to be noticed.

In suffocation from breathing a vitiated atmosphere, removal into pure cool air is generally sufficient to effect restoration. If it is not, the face and neck should be sprinkled with cold water ; air should be blown by the nostrils into the lungs ; and a turpentine injection should be thrown into the rectum. When the body is in such a situation that it cannot be removed into the fresh air, cold water should be thrown into the place, which will at once tend to absorb the carbonic acid gas, and causing a current of air into the place to purify that which is noxious. The same means are applicable to the fermentation vapour, the charcoal vapour, and the lime-kiln vapour.

In situations in which nitrous acid vapour has been accidentally disengaged, it should be neutralized immediately by ammoniacal vapours from carbonate or water of ammonia. When it has been inhaled, little can be done to mitigate its effects,

unless by employing the ordinary measures to control bronchial inflammation by blood-letting and the antiphlogistic regimen. When the air of any place is much loaded with sulphurous acid gas, cold water, by which it is rapidly absorbed, affords a ready means of purification. Air containing sulphuretted hydrogen, on the other hand, is instantly rendered harmless by the presence of chlorine gas, which possesses the remarkable property of decomposing this noxious vapour.

In most instances of asphyxia by the irritating gases, as nitrous acid, hydrosulphurous acid, chlorine, and sulphurous acid, even after respiration is restored, and the patient is partially recovered, symptoms of inflammation of the air-passages are liable to ensue. These are most conveniently opposed and alleviated by the employment of general antiphlogistic measures, as blood-letting, and local demulcents, as the inhalation of the vapour of tepid water.

§. V. Consumption; Pulmonary Consumption. Phthizic or Tizic. Decay. Decline. *Phthisis*; *Phthisis Pulmonalis*. Lungensucht; Lungen Krankheit; Die Schwindsucht; Auszehrung, Germ. La Phthisie Pulmonaire; Pulmonie, Gall. Tisica pulmonare; Tisichezza pulmonare; Morbo tizico; Pulmonea, Ital. Suchoty, Polon.

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THE term Consumption or Pulmonary Consumption (*Phthisis pulmonalis*), after having been long used in a general manner to denote any disorder in which wasting was the prominent symptom, is at present restricted to designate that kind of wasting, with more or less cough and expectoration, which depends on the destruction of more or less of the lungs from the presence of tubercular masses in them. It may be perceived that the term *phthisis* is here employed rather in an equivocal and ambiguous manner, to denote at once the state of an internal organ, and the consequent concomitant assemblage of the external symptoms. It may be understood to mean both

wasting and destruction of the lung by the tubercular disorganization; and also the wasting or decay of the body at large, which proceeds from this destruction of the lung. It is chiefly on this account that various modern pathologists have discarded the specific name *pulmonalis*, and use only the common term *phthisis*, or *phthisis tuberculosa*, as the nosological name for consumption.

Though the usual method in a work of this kind would require me to describe first the symptoms of pulmonary consumption and then the morbid anatomy of the disorder, and explain its pathological history, I believe that the simplest method will be to give, *first*, an account of the state of the lungs and other organs found in the bodies of those destroyed by consumption, then to consider its pathological relations, and *lastly*, to trace the history of its symptoms, its etiology, and its treatment.

MORBID ANATOMY.—In the bodies of those who have died after suffering from the usual symptoms of pulmonary consumption, as already specified, the lungs are always more or less changed in structure and more or less destroyed. In those who have been long ill, and who have been much wasted, the upper regions of one or both lungs are much indurated, and occupied by one or more irregular-shaped cavities or caverns, containing either air, or air and a little viscid puriform dirty-looking matter adhering to their walls.

Very generally the apex of one or both lungs is firmly attached to the inner part of the chest, by the pulmonary *pleura* adhering closely to the costal pleura by means of false membrane, which is usually thick, firm, and cartilaginous. The extent of this adhesion may be such, as, while it surrounds the whole lung, not to descend below the third or the fourth rib; beneath which the pleura may be free from inflammatory exudation or adhesion; it then forms a sort of cartilaginous cap or covering of the apex of the lung. But in some instances, while the pleura investing the upper lobe adheres firmly to the costal pleura, that covering the lower lobes and the middle lobe on the right side is covered by a layer more or less thick of albuminous exudation, while a quantity of sero-purulent fluid is found in the posterior part of the thoracic cavity. Almost invariably the lobes adhere by interlobular false membrane.

Sometimes the greater part of one upper lobe is hollowed into one large irregular cavity; more frequently the upper

lobe presents two or three caverns, either isolated or communicating; and in some instances the upper lobe is occupied by a number of cavities of moderate size, some containing air, others puriform dirty-looking mucus. The largest cavities are most commonly formed in the apex or upper region of the upper lobe; but occasionally a considerable cavity is found near the middle, or tending towards the base of the upper lobe, and corresponding with the pectoral and axillary regions externally. Cavities filled entirely or partially with matter have been named *Vomicæ*, sometimes abscesses rather improperly, and with greater propriety softened tubercular masses. When wholly or partially emptied, they are usually named tubercular cavities, or cavities, tubercular excavations, or simply excavations.

Lower down, for instance in the lower part of the upper lobes, the cavities are few, small, or none; in the middle lobe of the right side, also, cavities are rarely observed; and the lower lobes of both sides are in general entirely free from cavities. The whole of these parts, however, are more or less indurated by the presence of hard, solid, irregular-shaped masses, variable in size, but in general larger and more numerous in the upper and middle region of the united lungs than in the lower region.

When the caverns (*vomicæ*,) above noticed, are examined, they are observed to vary, not only in size, but in shape. They vary from the size of a large pea or small bean to that of a walnut, a pigeon's egg, or even a small pippin. Though their shape is more or less ovoidal, they are always irregular, and sometimes consist of one large or considerable cavern with two or three small appendages. The interior is always irregular, and more or less traversed by cylindrical bands or chords, (*septa*,) (*trabeculæ*,)* about the twelfth, the tenth, or the eighth of an inch in diameter, passing in various directions, but generally observing that of the longitudinal diameter of the lung, or observing a slight degree of obliquity.

These bands or chords (*trabeculæ*,) are formed in various modes. Laennec believed them to be formed of the natural

* Schroeder makes the term *trabeculum* neuter. But as it must be derived from *trabs* or *trabes*, which is feminine, and though a fabricated word, ought to be formed, as nearly as possible, according to the general principles of derivation, observed in the language to which it belongs, I conceive every accurate scholar will prefer the term *trabecula* to that of *trabeculum*.

tissue of the lungs, condensed as it were, and charged with tubercular matter, and maintains that he in no case found them to present traces of having contained blood-vessels. Schroeder, on the other hand, who frequently injected tuberculated and excavated lungs, represents them to be formed chiefly by the gradual and progressive obliteration of small blood-vessels by means of inflammation, the large ones receiving nutriment after the smaller ones have ceased to do so.* It is not improbable that they consist partly of inflamed and condensed cellular, that is, filamentous tissue, and partly of obliterated blood-vessels.

The inner surface of a cavity, chiefly or altogether emptied, though irregular, rugged, and hollowed into several subordinate depressions and eminences, presents, nevertheless, a smooth firm surface, which is observed to be owing to the presence of a newly formed membrane. When, indeed, the fluid and granular matter is removed by washing it repeatedly in water, it appears, though hard and somewhat cartilaginous, to be almost like an imperfect mucous membrane, or rather the villous surface of a fistula or sinus. This Laennec regards as a false membrane, or newly formed product; and certainly it presents several of the characters of false or morbid mucous membrane. Thus it is thin, smooth, whitish, or gray, semitransparent, soft, friable, and easily removable by the scalpel. In some instances subjacent to this thin semitransparent membrane, are one or portions of one a little firmer, rather more opaque, and more closely adherent to the walls of the cavity.

When the texture surrounding the cavity, and forming its walls, is examined, it is found to be solid, firm, incompressible, almost cartilaginous, entirely void of elasticity, more or less dark-red or brown, and serous fluid oozing abundantly from the divided surfaces. The bronchial tubes passing through such parts, and opening into the cavity or cavities, are often enlarged, and their membrane is invariably of a deep or bright-red colour, rough and villous, and lined with viscid mucus. In general these bronchial tubes are cut transversely across, or truncated at the point of junction with the cavity. In some rare cases, one bronchial tube is found passing through a cavity or a vomica, showing that it has escaped, or resisted the destroying process which commonly cuts it through. This

* *Observationes Anatomico-Pathologici et Practici Argumenti*, p. 77 and 78.

fact, noticed by Schroeder, I have also seen. But in general such bronchial tubes are at length destroyed, if the life of the patient be sufficiently prolonged. Neither Laennec nor Louis appear to have met with bronchial tubes within cavities; and perhaps the occurrence is rare.

The solidity and firmness of the surrounding texture is caused by two circumstances; the first, the presence of tubercular deposition in the lungs, and the second, inflammatory induration.

The tubercular deposit appears in the form of hard masses, which are amorphous or void of regular shape, and variable in size. When divided, these masses are solid, firm, sometimes almost cartilaginous, of a bluish or dirty gray colour, and when closely inspected, consist of granular bodies, various in size, from a millet-seed to a small pea, closely aggregated together, and mutually pressing each other. In various points are observed portions of whitish or grayish coloured viscid semifluid matter, which when removed are observed to be contained in small cavities. Such masses cannot be said to be homogeneous. Though invariably much more firm and incompressible than the surrounding lung, and than healthy lung, they consist of portions of different degrees of consistence, and of different colour. To the masses and their component parts, the name of tubercles is indiscriminately applied. It would be more correct if the denomination of tubercle were confined to one or the other, especially to the smaller component portions; in which case the large masses might be denominated tubercular.

The tubercular masses, as thus described, may occupy the superior and middle parts of the lungs, leaving very little of the sound lung intermediate between them. Lower down, and especially in the lower lobe, they are less extensively diffused, and smaller in size, so that portions of the lung are unoccupied by them. In general, also, they are more abundant at the posterior than at the anterior part of the lungs.

Tubercular masses vary in size, and may be distinguished in this respect into small, middle-sized, and large. The small masses are those about the size of garden peas, or small beans; the middle-sized are those about the size of a filbert, or small gooseberry, and all those above this may be designated as large. In general, when they have attained the latter dimensions,

they have either become partially softened, or they have begun to soften.

Though the tubercular masses vary in size, their component parts, viz. the minute tubercles, are generally about the same magnitude. These are commonly about the size of a millet-seed or a little larger; but in general the whole of the interior of a tubercular mass presents in the advanced stage such a confused mass of morbid texture, that it is impossible then to recognize the individual tubercles, or distinguish them from each other and the whole mass. It is only by examining tuberculated lungs in the early stage, and before the disease has proceeded far, that it is possible to form an accurate notion of the characters of a tuberculated mass.

The tubercular masses do not receive injection, and hence cannot be said to receive vessels from the large vessels of the lungs. Attempts to inject tuberculated lungs were made by Dr William Stark; and he always found that the injection reached neither the vomicae nor the tubercular masses. He found that blood-vessels which were of considerable size, at a little distance from a tubercular mass or masses, speedily became contracted, so that a large vessel, which at its origin measured nearly half an inch in circumference, could not be cut open further than one inch; and that when cut open, such vessels presented a very small canal, which was filled by fibrous substance, evidently albumen or coagulated blood. The same fact he also proved by blowing air into the vessels, or injecting them with wax. When air is impelled into the vessels of a tuberculated lung, the air either does not pass along the vessels at all, or does so in a very imperfect manner, nor does air in this manner reach the vomicae. If coloured wax or isinglass be thrown into the pulmonary artery and vein, the parts least affected by disease, and which before injection are soft and elastic, become afterwards the hardest and firmest; and the parts most occupied by tubercular masses, and which before injection are hardest, become after it much softer than the others. When a lung so injected is divided by incision, numerous minute branches filled with injected matter are seen in the sound parts, but in the diseased parts, few or no injected branches; and the matter is observed never or seldom to enter the tuberculated masses or their vomicae.

These and similar experiments were performed by Schroeder,

who found that no vessels pass through the centre of a vomica, but are closed, and as it were truncated at the margin of the vomica; that in cases in which numerous vessels pass transversely across a vomica or ulcer, though many of them are filled with wax, when injected, yet the small or capillary branches adhere to the trunks externally like filaments, or in the form of slender cellular tissue, but are obstructed and impervious, so that they do not admit the injected matter; whereas the trunks penetrating the vomica are surrounded by no pulmonary parenchyma, excepting the filaments described as the remains of the capillary vessels.

From these facts M. Schroeder concludes, that the obliteration begins in the small vessels and proceeds to the large trunks; that this obliteration is the effect of inflammation of the *vasa vasorum*, by which lymph is effused into the canal of the vessel, which unites its walls and renders its trunk impervious; that the *vasa vasorum* may not be so much affected by this inflammation, as to interrupt their circulation, and may continue, consequently, to nourish the obliterated trunk, which then forms the *septum* of Laennec, and the *trabeculum* of Schroeder; but that in those instances in which these nutrient vessels have become involved in the inflammation and obstructed, the trunk becomes black, dies, and is dissolved in the general suppurative destruction of the tubercular mass.

The state of the lymphatic vessels it is extremely difficult to distinguish in the lungs; and though M. Schroeder injected with mercury in lungs affected with *vomica*, some lymphatic vessels of the pulmonic *pleura*, yet he never found any one of them penetrating the substance of the lung. Subsequently, however, in the sound lung, he succeeded not only in injecting with mercury the lymphatics of the whole surface of the lung, (the pulmonic *pleura*, we presume,) but traced several branches into the pulmonic *parenchyma*, so distinctly, that he was satisfied that the lymphatics encompassed the lobules like meshes of net-work; and further traced to a small black tubercle in the surface of the lung, not far from the windpipe, several lymphatic vessels, which partly penetrated the tubercle, and partly poured mercury into it. From this circumstance, and from the analogous one, that tubercles in this situation often contain calcareous matter, M. Schroeder thinks it not unlikely, that the calcareous tubercles are the result of degeneration of the lymphatic vessels or glands.

It appears that the nervous filaments terminate with the vessels at the margin of the *vomica*, so that they appear to have been converted into a species of cartilage or tough cellular tissue. In one case described by this author, the nervous branches were reddened and thickened, numerous vessels being brought into view upon them by means of injection. Like Mr Swan, M. Schroeder saw in phthisical persons the pneumogastric nerve reddened and thickened; but in other cases he admits that he found it quite unchanged, so that he is averse to make any positive conclusion.

PATHOLOGICAL INFERENCES ON THE FORMATION OF TUBERCLES.—Before proceeding to describe the state of the other respiratory and circulating organs, and that of the intestinal canal, it is proper to consider here the mode in which these tubercular masses are formed, their nature, their progress and progressive changes, and their termination.

The question of the original formation of tubercles requires the previous consideration of three points; in which texture of the lungs are the tubercular bodies first deposited; in what form, fluid or solid, are they first deposited; and what is the cause of the deposition.

1. Dr Stark represents tubercles as formations in the cellular substance of the lungs. In like manner, Baillie inferred from dissection, that tubercles were deposited in the cellular, that is the filamentous tissue of the lungs; and this opinion, which has been very generally received without much question or inquiry, and is espoused by Laennec, derives verisimilitude from the appearances presented on dissection of the lungs of phthisical persons, in which in general it is impossible to distinguish anything but the tubercular masses, imbedded as it were, in the parenchyma of the lungs. We shall see, that, in order to obtain just views on this point, it is requisite to examine lungs in which the diseased deposit is just beginning, or not very far advanced, or very generally diffused through the lungs.

2. Another opinion, originating in the idea that consumption is a strumous distemper, and that strumous distempers are seated in the lymphatic system, is that tubercles are morbid formations or a degeneration of the lymphatic glands of the bronchi and lungs. This opinion has been more or less strongly maintained by Portal, Heberden, Broussais, and Nasse. "Upon dissecting the bodies of consumptive persons," says Heberden, "I have seen the lung crowded with swelled glands,

some of which are inflamed, and some suppurated or even burst.”*
 “After the most attentive examination,” says Portal, “I think that the tubercles constituting primary consumption are formed both by enlargement of the lymphatic glands distributed in almost all the parts of the lungs, or remote from the *bronchi*, and also by lymphatic swellings of the cellular tissue of the lungs, which, after becoming more or less indurated, frequently end in bad suppuration.”†

The same doctrine has been not less explicitly and forcibly taught by Broussais in several of his writings; and more recently by Nasse.‡

The great objection under which this doctrine at first sight labours, is its being at variance with anatomical facts. The lymphatic bronchial glands are situate chiefly round the ramifications of the *bronchi*; and though these glands are sometimes enlarged, and sometimes infiltrated with tyromatous matter in young subjects, this change is not uniformly or even often observed in pulmonary consumption. The bronchial glands, further, may be affected by tyromatous deposition, when the lungs are themselves either healthy, or at least not affected by tubercular deposit. Lastly, in those instances in which the bronchial glands are enlarged, indurated, infiltrated with tyromatous matter, or softened into suppuration, along with tubercular deposit, and tubercular excavations of the lungs, the former can always be readily distinguished from the latter, by the peculiar site which they occupy, and still more by their appearance, figure, and other physical characters. It is chiefly in children that this tyromatous enlargement, and transformation of the bronchial glands is observed; and in those cases in which the enlargement is associated with tubercular disease of the lungs, dissection at once shows the difference between the two lesions. The sections of the bronchial glands are large, homogeneous, circular, or elliptical, whitish, or grayish coloured, or grayish-blue surfaces round the large bronchial tubes. The sections of the tubercular masses are irregular, variable in consistence;—hard points and spots being mixed with softer portions, and the colour gray-blue, or bluish-red, situate in the substance of the pulmonic lobes and lobules.

* Commentarii. London, 1782.

† Observations sur la Nature et le Traitement de la Phthisie Pulmonaire, Tome ii. p. 309.

‡ Horn's Archiv, 1824, Juli, Aug. s. 106, et *apud* Rust, Handbuch der Chirurgie, B. xvi. *Tuberculosis*, s. 439.

As the affection of the lymphatic glands, therefore, is not adequate to account for the morbid appearances presented by phthisical lungs, Portal admitted that tubercles might be seated in other two textures. The first of these was in the lymphatic glands of the lungs, properly so called, which are smaller than the bronchial glands, more regularly rounded, and harder; and these he conceived became the seat of tubercular infiltration in certain forms of consumption, in which the disease began by plethoric or inflammatory symptoms.

The other texture in which he admitted that tubercles might be formed, is the cellular or filamentous tissue around the lymphatic glands, that is, the parenchyma of the lungs, agreeing in this respect with Stark and Baillie. This takes place, however, only under particular circumstances. After adverting to the induration of the lungs of phthisical persons, and their increased weight above the average, he states that this is owing to the extravasation of glutinous matter (albuminous matter,) which, after filling the lymphatic glands and the lymphatic vessels terminating in them, is further extravasated into the tissue of the lungs, and forms these tubercles sometimes in infinite numbers.

Part of this doctrine seems to be well founded, and part of it is perhaps open to objection. When it is admitted that tubercles may arise from extravasation of albuminous matter into the substance of the lung, the exclusive deposition of these bodies in the bronchial or lymphatic glands is virtually abandoned. The only question is, whether this effusion is the effect of the preliminary abundance of fluid in the glands and lymphatic vessels; and whether this alleged extravasation, which forms tubercles in the filamentous tissue of the lungs, may not take place without affection of the glands, and does not take place, as Broussais seems to think, previously to that affection of the glands? It is proper to add, that M. Andral admits that this mode of the formation of tubercles in the lungs, viz. by tubercular matter being deposited in the lymphatic ganglions of the interior of the lung, is not improbable.*

3. An opinion, which appears upon the whole to be most consonant to the facts, is that which was brought forward in 1826 by M. Schroeder, who fixes the seat of tubercular deposition in the extremities of the bronchial tubes, or in what are

* Clinique Medicale, Part iii. sect. iii.

named the pulmonic vesicles, in which the tubercles are deposited from the vesicular membrane in a state of inflammation.

In order to form a clear conception of the origin of the process of tubercular deposition in the lungs, it is necessary to examine these organs in the bodies of persons cut off by other diseases, and in the earlier stages of consumption, when the disease has made little progress. At this stage of the disease it is still uncomplicated with marks of general inflammation of the lung, or its component tissues; and at the worst there is merely topical change.

If in this state tubercles be divided and inspected by the aid of the microscope, it then appears that the air-cells of the lungs are filled with some opaque material, which renders them less pellucid, the nearer the eye is directed to the edge of the tubercles. The cells filled with pellucid coagulable lymph are harder than the neighbouring sound cells, and do not admit the air, as easily appears by slight pressure in water. This lymph contained in the cells is sometimes so limpid, that the tubercle can scarcely be distinguished by the eye from the sound structure of the lung, and requires the aid of touch.

In other spots, however, the centre of the tubercle is already white, and losing its transparency, has become opaque; so that by the aid of the microscope, in the centre of the cell little or nothing can be distinguished, and their *parietes* appear united with the matter of the tubercle, while the adjoining cells still contain transparent matter. From this fact the author infers, in opposition to the representation of Laennec and Lorinzer, that in certain air-cells, or in a lobule of the lung, local inflammation may be developed, and produce effusion of lymph which obstructs the air-cells.

As this exudation proceeds, the walls of the cells are at length compressed on all sides, and not only unite with the contained lymph; but, as the effusion hardens and becomes opaque principally from the centre to the circumference, a mass of lung thus occupied becomes solid and granular in the centre, and softer at its margins.

The shape of the tubercular mass thus formed depends on the structure of the lung,—a circumstance on which authors have not bestowed sufficient attention. The lobes of the lungs consist of lobules united by cellular tissue; and each lobule receives a separate bronchial tube, which terminates in many air-cells, all pervi-

ous to air,—and a peculiar artery and vein, each subdivided into many minute vessels, all penetrable by injected fluids in the sound state. It hence results, that the beginning of tubercular deposition is confined at first to one lobule only, without affecting the contiguous lobules, and is recognized only by the greater opacity and firmness of that lobule than of the healthy ones. It is also found, by injecting the arteries and veins of the lung, that some lobules are less penetrated with this tubercular deposition than others, the vessels of the former being more susceptible of injection, while those of the latter are few in number and less penetrable by injection, and diminish in this manner in number and susceptibility of injection, till in the truly and perfectly tuberculated lobule the small vessels are completely shut and obliterated, and the large one only remains pervious. In such lobules the structure of the lung can no longer be traced; the shape of the air-cells is destroyed; and in the centre of these tuberculated lobules, which is hollow, suppuration has commenced. Such tuberculated lobules are whiter than the adjoining ones, and are surrounded by thick cellular tissue separating them from the adjoining lobules, which may at this stage of the disease be less affected. Very soon, however, the air-cells of these lobules become penetrated by the same deposition, which in like manner becomes opaque and firm, and agglutinates the cells into a similar firm, inelastic mass, also surrounded by indurated filamentous tissue. When at length several lobules have in this manner become penetrated and occupied by tubercular deposition, with the suppurative destruction proceeding in their respective centres, the coalescence into a single undistinguishable mass is followed by the union of their respective minute cavities into one or more larger ones. In the course of this process, the cellular, or rather what I term the filamentous, tissue of the lung being placed outside the penetrated cells, naturally resists longest the suppurative process, and may even become thickened and indurated. At length, however, this also may give way, and be destroyed partially or entirely; and hence appears the reason why some anatomists maintain that the tubercle or small *vomica* is surrounded by a membrane, while by others this is denied.

From this account of the progressive formation of tubercles, it results, that not only the air cells are filled, and then obliterated by the exudation of coagulable lymph, but that

the areas of the blood-vessels are so contracted that they no longer admit the wax of injection, and become obliterated, and incapable of receiving and conveying blood to the ultimate terminations; and hence the centre of the tubercle wastes, and is consumed and degenerated; and that the vessels, still pervious, assuming the inflammatory action, secrete purulent matter, which dissolves the tubercle already softened and macerated. M. Schroeder van der Kolk further regards this deposition as coagulable lymph, because by immersion in spirit it is coagulated and rendered opaque; and he therefore contends that it is impossible to adopt the view of Laennec and Lorinzer, or Nasse, that tubercles are formed without previous inflammation. The argument also adduced by the latter author, that tubercular deposition takes place generally in the upper lobe of the lung, whereas peripneumony occurs more frequently in the lower one, he thinks of no moment. He admits the fact; but maintains that it merely shows that tubercular deposition and the consequent *vomicæ* differ from peripneumony, and that chronic inflammation differs from the acute form of the disease.

The question regarding the origin of tubercles from degenerated bronchial glands, he allows to be more difficult of decision,—from the fact, that frequently degeneration and inflammation of the glands of the neck, or some other part, precede the appearance of consumption, and that strumous persons are very liable to the disease. He observes, however, that in examining carefully the bodies of the strumous, when the vessels were filled with fine injection, he found very minute tubercles occupied in different points by concretions, and in general calcareous rather than tubercular matter deposited. In examining such lungs microscopically, he found the minute branches of the bronchial tubes, at least to one-fourth of a line in diameter, everywhere reddened within by injected vessels, and a beautiful network expanded on the internal mucous membrane; in some of the minute branches, he saw the smaller glands thick and somewhat whiter; the miliary tubercles were surrounded by a net-work of vessels, in which he could distinguish the air-cells still open. These tubercles generally adhered externally to the branches of the bronchial tubes, or to the pulmonary arteries and veins; in some cases a small bronchial tube seemed to end in a tubercle. Externally the pulmonic *pleura* was marked by black round lines like rings, which appeared to be lymphatic vessels. Where the degeneration was a little greater, the cells were ob-

literated, and the tubercles, the vessels of which were imperious, appeared to have coalesced into a whitish mass.

This author doubts, nevertheless, whether these bodies, which he denominates *miliary tubercles*, were not obliterated vessels, which, when cut across, presented the appearance, but had not the reality of tubercles, the more so, that these tubercles could be traced through the lungs in the direction of ramification. He further expresses the suspicion, that these tubercles are first formed by thickening, and inflammatory degeneration of lymphatic glands, and that this is the reason why they present a different appearance from that of the ordinary tubercles of the air-cells already described,—since they seem to adhere most to the smaller bronchial tubes.

As to the origin of the calcareous matter, he does not admit that these concretions could be formed by the inhalation of dust or sand, since their structure is too complex, and the opinion is sufficiently refuted by analysis ; but he thinks, that the surrounding membrane, whether that of a gland, or an air-cell, had so degenerated by inflammation as to assume the fibrous character, and the faculty of osseous or calcareous secretion.

He infers, therefore, that the lungs present two kinds of tubercles ; one produced by chronic inflammation of the air-cells, by which their membrane is made to secrete lymph, which fills and unites them into a mass ; the other more calcareous, produced apparently by degeneration of the minute glands ; but both agreeing in inducing inflammation of the adjoining air-cells, and *vomicæ*. The suppuration which produces the latter change, and which commences most frequently in the centre, though sometimes in the side of the tubercle, presents this peculiar difference from common suppuration, or that which takes place in wounds, that, whereas in the latter, granulations are formed, by which the cavity is filled, in the former no granulations take place, because no new vessels are formed ; and as the vessels are obstructed and convey no new matter, the tubercular mass is softened by a species of partial death. When this suppurative destruction, begins, it proceeds in general till the tubercular mass is broken down and excavated ; and it is much less common to find a tubercle partly dissolved than entire, or a small *vomica*, after the tubercle has been destroyed by suppuration. In this state the *vomica* is lined by a thin vascular membrane, sometimes by a thick yellowish one ; and if small, it is rarely traversed by any vessel ; but this is not un-

usual in large *vomicæ*. The author also observes, that these tubercular masses afford, in the process of softening, an illustration of the general principle formerly laid down, that every inflamed part and ulcer presents at the same time different degrees of inflammation. The centre of the tubercle may be dead or expelled after the process of solution; its crust may be in a state of suppurative softening; the circumference may be inflamed; and this process diminishes in the parts of the lung farthest removed from the margin of the air-cells.

In the manner now mentioned, the cavity of a *vomica* is progressively enlarged, until in desperate cases of consumption the patient sinks under the disease. The extent to which the lung is destroyed before this event takes place, varies according to the age of the parties.

Similar views of the mode in which tubercles are originally deposited in the lungs have been taken by M. Andral, Dr Carsewell, M. Ravin, and other pathologists. The bronchial tubes terminate in shut sacs; and do not communicate at the further or terminal extremities, as was imagined by Helvetius, Haller, and others, but remain isolated and separated by the vesicular mucous membrane, and the submucous or filamentous tissue. This vesicular mucous membrane is liable to various forms of inflammation, in which it secretes a fluid or semi-fluid matter, which contains much albumen, and consequently is liable to undergo spontaneous coagulation. This has been sometimes named strumous matter, glutinous matter, (Portal,) plastic lymph, (Schroeder,) coagulable lymph, purulent matter of particular nature, (Lerminier and Andral,) and tubercular matter. None of these denominations convey a just notion of the object; and the latter is objectionable, because it is applied indiscriminately to several kinds of morbid texture, different both in nature and in form. But it is sufficient to know that the mucous membrane of these bronchial terminations or vesicles is liable to a kind or form of inflammation, which is perhaps peculiar, and that in this state it secretes matter, which, though at first fluid, afterwards becomes solid, filling up and obstructing the terminations of the tubes. As the matters effused become solid, they naturally assume the rounded or oblong-rounded form of the pulmonic vesicles; and in this state, as they are small, firm, rounded bodies, harder than the neighbouring parts, and giving them a knotty appearance, they are tubercles (*tubercula*), or little tuberosities.

That this is one and perhaps the most usual mode in which tubercles are formed, must be regarded as established by the accurate and beautiful delineations of Dr Carsewell, who has represented the tubercular matter, as he terms it, when deposited on the free surface of the bronchial mucous membrane, at the extremities of the bronchial tubes. Andral manifestly takes the same view of one of the modes in which pulmonary tubercles may be formed.

Frederic Peter Ludovic Cerutti, who published in 1839 a short but learned dissertation on the subject, states, that after repeated observations, he had not been able to satisfy himself of the facts adduced by Schroeder; but allows it to be proved that the cells of the lung in those parts becoming occupied by tubercular matter, and which differ from healthy cells in presenting a different colour, contain no air, because not only individual portions of lung sink in water, but also a whole lobe, which still fresh, on being immersed in water, sunk more than one-half, immediately after being inflated by air, rose to the surface.

From this fact, he is convinced that tubercles, in their origin, consist of a fluid exudation, which moistens the walls of the pulmonic cells, which, he argues, are mutually compressed by the increased weight caused by this humidity, to such a degree only, that, though the inspired air is unable to enter them, they may nevertheless be expanded by artificial inflation.*

In the first commencement of this distemper, the colour of the affected portion of the lung only is changed; and as yet the secreted matter is probably soft and semifluid, or at least not very firm. But after some time, when the effused matter has acquired consistence, and become a little firm, the part is felt between the fingers as if it contained several hard knots. These are granular or graniform bodies within the air-cells, filling, distending, and preventing them from collapsing. The size of these bodies in this stage is about that of a pin-head, rising to a millet-seed or a grain of mustard seed. These bodies, now described, have been, in this state, regarded as the miliary tubercles of Bayle and Laennec, the disseminated tubercles of Gendrin, and the simple tubercles of Dr Lombard and Dr Home. But this does not appear to be established with unquestionable certainty. One variety, at least, of the miliary tubercle, I am inclined to think, is formed in the filamen-

* *Collectanea quaedam de Phthisi, &c.* Lipsiae, 1839, 4to.

tous tissue of the lungs ; and certainly differs widely in arrangement and appearance from the bodies now mentioned.

One of the clearest modes, it appears to me, of demonstrating the origin of the most usual forms of pulmonary tubercles, is by observing what takes place in lobular pneumonia. In this disease inflammation attacks the lung in individual lobules, perhaps beginning first like vesicular *bronchitis*, that is affecting the final terminations of the bronchial tubes, and perhaps in a slight degree their submucous filamentous tissue, or the parenchyma of the lung in which these vessels are imbedded. The result of this inflammation is the effusion into the vesicles of a species of soft semifluid matter, intermediate between albumen and gelatine, but which undergoes coagulation, and thereby fills the vessels with an equal number of small roundish bodies, of moderate consistence, but which eventually become firm, and at length hard, while their mutual proximity aggregates them together into small hard masses, isolated, and limited to each pulmonary lobule, or part only of a lobule. As the disease proceeds, it affects the whole lobule, which then presents the appearance of a hard knotty mass, irregular in shape and figure, and surrounded by natural or sound pulmonic tissue. This disease may either affect one or two, or many lobules simultaneously and successively ; and in proportion to the extent over which it is diffused, the lung is occupied by bodies having all the characters of tubercles, and which eventually constitute pulmonary tubercles.

In this state, these masses, when divided, are firm, of a bluish-gray colour, and consist of minute portions aggregated together, in a confused manner, so as to form a mass not quite homogeneous, but firmer than the surrounding lung. In this state, before these masses have become softened, they constitute what has been named by Laennec crude or yellowish tubercles, (*tubercula cruda*), agglomerated tubercle by Gendrin, multiple tubercle by Lombard, and aggregated tubercle by Dr Home. These masses vary in size, from that of a garden pea or a cherry-stone, to that of a walnut or even larger. Though the surrounding lung may be sound, yet the portions of lung which previously were in the place of these tubercular masses are completely solidified ; and hence neither bronchial tubes nor blood-vessels are traced into them.

Another lesion, which has been believed to form a certain stage of this process of the conversion of isolated or simple tubercles

into aggregated tubercles, is that which has been named gray, semitransparent granulations, and which, indeed, are the miliary or cartilaginous tubercles of Bayle. It is certain, both from the researches of Dr Carsewell, Andral, and Cerutti, that they may exist in the lungs without giving rise to the peculiar structure already described as tubercular. They are generally isolated, very seldom aggregated, disseminated or dispersed through the lungs almost indiscriminately; and it is very doubtful whether, if they be formed in the air cells, they are always formed in them.

Andral regards these gray granulations as indurated and hypertrophied air cells. I have several times observed them in the filamentous tissue of the lung, in such circumstances that I thought it scarcely possible for them to be formed in the cells. In some instances they appear like transformation of certain portions of the lymphatic vessels or glands of the lungs. They are occasionally observed in the lungs of quarry-men, stone-cutters, and hewing-masons.

In certain cases, however, of this sort of lesion, it has been ascertained that these gray, semitransparent, hard tubercles are deposited originally in the pulmonic vesicles. Thus, Dr Home mentions that a specimen of this kind of tubercle, occurring in a hewing-mason, was presented in 1838 to the Anatomical Society, in which it was found that in the centre of each tubercle was contained a grain of sand or earthy matter, ascertained to consist of silica and carbonate of lime, and which had no doubt been inhaled, and gave rise, by mechanical irritation, to chronic inflammation in the ends of the bronchial tubes.

A third lesion, which has been sometimes rather vaguely called tubercular, is what may be termed gray hepatization, occurring in definite masses, or circumscribed gray hepatization, or, what might be less objectionable, circumscribed tyromatous deposition.

In this state, a portion of lung, more or less extensive, becomes the seat of considerable induration and solidification; and when a portion thus affected is divided, it is observed to consist of various minute, gray-coloured, firm bodies or grains aggregated together, and which give the section a gray or light-yellow colour, and a granular aspect. There is no doubt that this change in the consistence and appearance of the lung is the effect of inflammation, acute, subacute, or chronic; but it is not quite certain that the presence of this state is a neces-

sary step in the formation of tubercles. This change may probably take place in any part of the lung; but the situations in which I have most usually seen it are the upper lobe near its apex, and sometimes the middle lobe of the right side. This has been observed by Baillie, and described by Laennec, under the name of tubercular infiltration, and by Dr Home, under the name of diffuse tubercle.

In this form of the disorder, the morbid deposition does not begin in the air cells exclusively, as in the first described, but affects all the elementary tissues of the lung at once in one uniform disorder; and it gives rise to extravasation of albuminous or rather tyromatous matter, over the whole space which it affects, but effused into the filamentous tissue, and compressing and thereby obliterating the air vessels, the tubes, and the blood-vessels all at once. Often also the surrounding lung is converted into a sort of membrane or capsule for the mass, so that the tyromatous deposit appears as it were encysted. The size which these masses acquire, varies from that of a small gooseberry to a large one or more. When divided, besides the yellow or gray colour already mentioned, they present a much more uniform or homogeneous aspect than the other forms of tubercular deposit.

The state of the surrounding lung, though often congested or reddened, varies much both in these different forms of deposition and also in different stages of its progress. In the early stage, or that of crudity, the substance of the lung around may be crepitating, elastic, and compressible; and even in the advanced stage, some observers have found the lung interposed and surrounding, free from induration or much redness. Thus Baillie and Soemmering found the substance of the lung surrounding considerable tubercular masses healthy; and Laennec and Louis appear to have observed the same fact. Much more frequently, however, there are more or less reddening, vascular congestion, and infiltration of serum into the substance of the lung; and in a considerable number of cases I have observed pneumonic inflammation, either in its first or in its second stage.

In the case of the isolated tubercular infiltration, chronic pneumonia is very common. At least in the cases of that form which have fallen under my own observation, I have observed, that symptoms altogether like those of pneumonia or peripneumony took place during life, and, upon inspection after death,

the usual appearances left by inflammation of the substance of the lung were found.* These tubercles, indeed, do not appear readily to undergo the process of softening, and most usually prove fatal, either by being complicated with or inducing pneumonic inflammation.

The manner in which tubercular masses are softened or broken down and discharged, or what may be termed the mechanism of tubercular softening, and excavation, has attracted some notice, and deserves consideration. At one time, it was imagined to be either identical with, or analogous to, suppuration in other tissues; and it was supposed that tubercular *vomicæ* were merely abscesses of the lungs. But the process, though perhaps analogous to, is not the same with, suppuration. It seems to be more complicated, and not so uniform in its progress. It seems to be difficult to ascertain at what part softening commences. In one case it may begin in the centre, and proceed to the circumference; in another it may begin at the circumference, and go round the whole mass, detaching it from the surrounding lung; in a third case it may begin at once at the centre, and at the margins; and, in other cases, it has been observed to commence at the same time in several parts of the substance of the tubercular mass. The latter is the course especially in the case of large tubercular masses. Cerutti,† who entertains this opinion, states that, in the section of a tubercular mass in this state, the portion or spots about to be softened appear to lose firmness and to become friable, and, if examined by the microscope, it presents numerous minute holes, as if punctured by a needle. This condition extends over the whole mass, until its parts are detached from each other; and minute grains are found amidst a semifluid or fluid opaque mass. While this is proceeding, a communication is established with one or more bronchial tubes, as already stated above, the small ends of which are destroyed or dissolved in the softening process, and the semifluid matter reaching them irritates them, causing secondary catarrh, and excites coughing, by which it is expelled. The transition of this semifluid matter through the bronchial tubes is the cause of the redness and

* Two Cases of Tubercular Deposition, &c. By D. Craigie, M. D. Edin. Med. and Surg. Journal, Vol. xliii. p. 273.

† Collectanea quaedam de Phthisi Pulmonum tuberculosa scripsit et in Universitate Lipsiæ, in die xviii. Junii A. C. 1839 publice defendit, Dr Frid. Petrus Ludovicus Cerutti, Pathologiæ et Therapiæ Specialis, P. P. O. Des. Lipsiæ, 1839, 4to, p. 22.

villous appearance of the mucous membrane of the bronchial tubes, so generally observed in the lungs of those destroyed by this distemper.

On the means by which this softening is effected, different opinions have been entertained. An opinion very generally received is, that the tubercular masses, acting in some manner as foreign bodies, give rise to irritation and vascular action in their vicinity, and in this manner induce a sort of congestive and inflammatory afflux of fluids, in which they are melted or dissolved in an imperfect suppuration. This opinion is chiefly supported by those facts which show that tubercles begin to soften near the circumference of the masses.

Many tubercular masses, nevertheless, seem to possess an internal or innate tendency to destruction. Their texture is imperfect, (see p. 969 ;) and in some instances the internal substance begins to soften, apparently whether any irritation of the surrounding lung has taken place or not. There is no doubt that, in a considerable proportion of cases, the presence of the irritation of severe *bronchitis* or *peripneumony* appears to have pushed the tubercular masses into speedy liquefaction; and the frequency with which the symptoms of pneumonic inflammation are succeeded by those of consumption, shows that in the formation of softening at least, if not in the development of tubercular deposits, inflammatory congestion has great influence.

As softening proceeds, whether it has been attended with pneumonic inflammation or not, it is speedily followed by that, and by bronchial inflammation, the latter being chiefly induced and maintained by the incessant irritation kept up by the transition over the membrane of the contents of the tubercular softening. If the tubercular mass be large, or if the degree of pneumonic inflammation be considerable, it affects a third membrane, viz. the pleura. And, indeed, in all cases in proportion to the size of the tubercular mass, and the consequent excavation to be formed, and as that advances from the substance to the surface of the lungs, pleurisy takes place. The great use of this inflammation, or what may be termed its final cause, in the softening and expulsion of tubercular masses, is, by the effusion of lymph and the formation of adhesions between the pulmonic and costal pleura, to prevent perforation of the lung, the escape of air and tubercular matter into the cavity of the pleura (*pneumathorax*, and *empyema*,) and the consequent for-

mation of pleurisy complicated with pneumathorax,—a lesion generally fatal. By the slow and gradually advancing inflammation of the pleura, and the consequent albuminous exudation and adhesion, this accident is prevented. This is so common, that in one case only among 112 were the lungs free of adhesions.

It, nevertheless, sometimes happens that this accident takes place. The apex of the lung, I have already said, is very generally covered all round with a thick, cartilaginous coat of false membrane, uniting it to the interior of the thoracic walls; and any cavity formed in this region is thus prevented from opening into the pleura, and the general thoracic cavity. But if in the lower region of the upper lobe, any large tubercular mass is softened and expelled, and leaves a considerable cavity, verging towards the pectoral and axillary regions, it occasionally happens that adhesion has not taken place there, and that the walls of the cavity, already extenuated to an extreme degree, give way, or are perforated, especially during a fit of coughing and air, and tubercular matter escape into the pleural cavity, and there produce first collapse of the lung, and then pleuritic inflammation. Among 112 cases observed by Louis, perforation was known to take place in eight cases, and in seven of these it took place on the left side. Among 100 cases recorded in the Royal Infirmary Report, perforation took place in six, in three on the right side, and in three on the left. Since the publication of that report, I have met with only one case of perforation, among seven cases inspected under my own care; and in that case, perforation took place in the left side, in the lower part of the superior lobe.

MORBID ANATOMY OF THE APPENDAGES OF THE LUNGS AND THE OTHER ORGANS.—Besides the state of the lungs above described, the trachea, larynx, and epiglottis are liable to present various lesions. The membrane of the epiglottis is always reddened, and sometimes softened; and the whole laryngeal and tracheal membrane is reddened and softened, or rendered flaccid. Ulcers also, various in size and shape, may be formed in these parts. Among 102 cases examined by Louis, ulcers of the epiglottis were found in eighteen cases (one-sixth); ulcers of the larynx in twenty-two cases (one-fifth); and ulcers of the trachea in thirty-one cases (one-third).

Most of the ulcers of the epiglottis are confined to the lower

or laryngeal surface of that cartilage. The ulcers are generally small, one, two, or three lines in diameter. They are more common in males than in females.

The most frequent seat of ulcers of the larynx is the junction of the vocal chords; then the vocal chords themselves, especially their posterior part; and lastly, the base of the arytenoid cartilages; the upper part of the larynx, and the interior of the ventricles. In some rare cases one or more of the vocal chords are denuded or destroyed, and the base of the arytenoid cartilages exposed.

Ulcers of the trachea, sometimes very large, are found chiefly in the posterior or fleshy part of the canal, and are attended with a red colour, more or less deep, of the contiguous mucous membrane, and some softening and thickening. In rare cases, the ulceration spreads so much as to denude or destroy more or less completely several of the cartilaginous rings; and in that case the ulcerated ends of the rings give the margins of the ulcer a peculiar, irregular, and denticulated appearance.

The only general result that can be established regarding the heart, is, that it is rendered smaller and softer than usual, or is atrophied.

Mr Abernethy found that, in severe cases of pulmonary consumption, in which the lungs were much occupied by tubercular masses, by injecting the arteries and veins of the heart, the injection readily flowed into the chambers of the organ, and that the left ventricle was first and most completely filled. He found that the channels of this injection were the *foramina Thebesii*, which, though in the natural state few and small, become numerous and large in disease of the lungs, especially tubercular induration, which impedes the circulation of the pulmonary artery, and thereby distends and gorges the right chambers of the heart. Mr Abernethy also found the *foramen ovale* more or less open in the hearts of persons destroyed by pulmonary consumption.*

In about from one-tenth to one-fifth of cases of consumption, the stomach is enlarged or distended to two or three times its usual bulk. The mucous membrane of the organ is very generally in an unhealthy state, either wholly or partially. It

* Observations on the *Foramina Thebesii* of the Heart. By John Abernethy, F. R. S. Phil. Trans. 1798. Part I. p. 10.

may be in the splenic end softer and thinner than natural, with a bluish-white or yellowish colour. This takes place in one-fifth.

The same part may be reddened or softened. In about one-fifth the mucous membrane of the anterior coat is red, thickened, and softened,—generally in connection with enlargement of the liver. Ulcers, prominences, and granulations, are found in a smaller proportion of cases. Most of these lesions are to be viewed as the effect of some form of inflammation; and it is established that, in the phthisical, irritation of the gastric mucous membrane or inflammation is very readily induced.

By far the most constant lesion in the alimentary canal of the phthisical, consists in some change in the mucous membrane of the ileum or of the colon.

The most common lesion in the former is the presence of ulcers, which are observed in five-sixths of the cases. In one-sixth they occupy the whole tract of the intestine; and in the other two-ninths they are found only at the lower part of the *ileum*. These ulcers always correspond to the aggregated glands of Peyer, in which they begin; but as the disease proceeds, if life be protracted, they extend to the mucous membrane in general, and thus are found to occupy the greater part or the whole circumference of the bowel. Their shape is elliptical, annular, or linear. In general, at the commencement, they appear in one or two points, that is, in one or two follicles of one of the aggregated glands. In the advanced stage of the disease, several of these coalescing may form a large and extensive ulcer. The latter is mostly seen at the lower end of the ileum, where that bowel enters the colon. In some instances these ulcers may commence in the isolated follicles; but this is not common.

A lesion less frequent is the presence of granulations, semi-cartilaginous or tubercular, in the ileum. These lesions, which appear to be seated in the isolated follicles of the bowel, and which consist in tubercular degeneration of the follicles, take place in three-eighths of the cases.

Much in the same manner, and at the same rate, is the mucous membrane of the colon liable to be diseased. It is reddened either continuously or in patches. The most common lesion is the presence of ulcers, which are formed in from eight-elevenths to seven-ninths, or about nine-twelfths. They may be large, middle-sized, or small. The most common situations

are the cæcum, the ascending colon, the transverse arch, and the rectum, in the order now specified. When the cæcum is affected, the ulceration is often extensive, being associated with ulcers or ulceration of the lower end of the *ileum*, the ileo-cæcal valve, which is often stripped of its mucous membrane, or altogether destroyed, and over the whole inner surface of the cæcum. In the ascending colon and transverse arch, the ulcers present the appearance of broad flattish patches, the largest diameter being across the intestine, the converse of what is observed in the *ileum*. These ulcers may commence in the mucous follicles of the colon; but they eventually pass to the mucous membrane in general.

Tubercular granulations are found in the colon in a smaller proportion of cases.

Of these ulcers or ulcerated patches it is a pretty general result, that, as they destroy the mucous membrane, and advance through the subjacent coats to the peritoneum, they cause in the latter inflammation in minute isolated points or spots, followed by effusion of albuminous fluid, which coagulates and adheres in an equal number of minute points, opaque, elevated, and generally isolated, but touching each other, so as to form a rough patch, circular or oval in shape. In this state, these small whitish opaque bodies present the appearance of tubercular specks, and are hence called by many authors tubercles of the peritonæum. Whatever be the name applied to them, they are formed in the mode now mentioned.

The final cause of this peritoneal inflammation is to counteract ulcerative perforation, and to thicken and strengthen the bowel. In some rare cases, however, this object is defeated, and the ulceration destroys all the textures, and the *peritonæum* suddenly gives way, allowing the escape of air and the intestinal contents into the abdomen, and causing sudden fatal *peritonitis*. This accident is, however, not very common. One example only have I met with among nearly one hundred instances of fatal consumption.

In other cases, effusion of sero-purulent or purulent fluid is found within the peritoneum, and soft coagulable lymph between the intestinal folds, showing that the membrane must have been inflamed during life.

In the bodies of the phthisical the liver is very generally in a morbid state. The most frequent change in this country is that

of *cirrhosis*, with more or less enlargement and induration, in which sections of the gland show it to have a peculiar yellow colour, with a darker hue of the *acini*. This takes place in rather more than one-third of the cases. The most common change in France appears to be the adipescient transformation of the organ, which occurs in one-third of the cases. In this the organ is pale fawn-coloured, more or less tender and friable, chequered with red outside as well as within. The bulk of the organ is always increased, sometimes to the amount of twice its usual dimensions. In this country, this change does not take place in so many as one-sixth of the cases. The former lesion is most common among males; the latter among females.

The brain is very generally slightly softer than natural. The membranes are injected; and fluid is effused beneath the arachnoid membrane and within the ventricles.

Tubercular deposits or tyromatous matter, fluid or semifluid, or solid, are found in various other organs besides the lungs. Thus the ileum and the colon are said to become the seat of this deposit; but perhaps it is rather the albuminous effusion in the granular shape, than real tyromatous matter, which has received this character. The deposit, however, is found in the mesenteric glands, the cervical lymphatic glands, the lumbar glands, the prostate, the spleen, ovaries, kidneys, womb, brain, and *cerebellum*, in the order now mentioned.

The usual termination of the lesions of the lungs above described is in death. As the contents of the tubercular masses are softened and expelled into the bronchial tubes, they cause in these and in the windpipe and lungs most violent irritation and inflammation, with consequent copious secretion of puriform mucus, which is mingled and spit up with the proper tubercular matter. As this process advances with several tubercular masses simultaneously and successively, very general bronchitic and tracheal inflammation is induced; and, at the same time, with them symptoms of peripneumony and pleurisy may be combined, from the causes already specified. In this state of matters, the function of respiration is gradually confined in its extent and effect, until it is nearly annihilated, when, perhaps, not more than one-fourth, or, in some cases, one-sixth, or one-tenth of the lungs is left permeable to air and blood. Death then ensues, partly as the effect of the exhaustion from

constant tracheo-bronchial irritation, partly as the effect of exhaustion from annihilated respiration.

Notwithstanding the frequency of this as the usual termination of the process of tubercular destruction, softening, and excavation, there is reason to believe that, in an extremely small proportion of cases, recoveries from very ominous states take place, after all the usual signs of consumption have existed for a sufficient time to render the conclusion probable that these symptoms were caused by tubercular softening and excavation. As the evidence of this fact is at once doubtful and important, it is best to state it, as it most usually is observed.

1. It occasionally happens, that, in inspecting the bodies of persons destroyed by several different diseases, there is observed in the upper lobe of the lungs a peculiar morbid state. The *pleura* is puckered and shrivelled into small, firm, irregular portions, in which there is distinctly felt a sort of leathery firmness, and beneath that a body, globular or irregular, pretty firm and resisting. When this is divided, the *pleura* is found to be shrivelled and a little indurated, contracted downwards and inwards upon the hard body, and the substance of the lung hardened and shrinking, enclosing the hard body, which is then found either like a portion of soft putty, or more consistent, like chalk slightly moistened with water. This is regarded as a cicatrized or contracted vomica. The putty-like or chalky contents are the thicker part of the softened matter of the tubercle after the thinner have been expectorated or removed by absorption. In cases of this kind, in which such chalk-like masses, usually encysted, are contained in the apex or upper regions of the upper lobes, the rest of the lungs are in general either free from tubercular masses, or are little occupied by them, or present some miliary tubercles disseminated through their substance.

In some instances, these solid bodies are perfectly firm and almost stony, grating against the knife.

Changes of this kind, however, M. Louis thinks, do not depend on any determinate lesion. From the soundness of the rest of the lung, and the small space which such bodies occupy, it is possible that these putty-like bodies may be tyromatous masses in the early stage degenerated, and the calcareous concretions phlebolites, or concretions in parts of the lungs previously inflamed.

2. In other instances, however, appearances of a less equi-

vocal nature are recognized. In examining the bodies of persons who have previously suffered from cough, breathlessness, expectoration, and wasting, there are found in the upper lobe of the lungs, irregular cavities lined by a semicartilaginous membrane, similar to that formerly described, but firmer and smoother, containing particles of whitish chalky-like matter, or even putty-like matter adhering. In other instances, cavities, irregular in shape, but marked by septa or partitions, are found lined by a firm smooth false membrane, empty, that is, containing only air; while in the same lung may be found tubercular masses partially or wholly softened, and, in some instances, crude tubercular masses.

At the near extremity of such cavities the bronchial tubes, which are truncated, are in general also dilated or enlarged in diameter; while those at the further extremity are shrunk and contracted, or altogether impermeable. These cavities also themselves show a tendency to contraction, by the lung, and even the thoracic parietes, pressing them mutually together. When this contraction or shrinking of the cavities takes place, the extremities of the nearer bronchial tubes also are contracted, from participating in the centripetal pressure; and in some instances, they are impermeable and obliterated. This lesion has been well represented by Reynaud in his fourth plate, fig. 1, who has detailed several cases, showing the frequency of obliteration of the tubes, in cases both of fatal phthisis, and in those in which partial recovery appeared to take place.

Lastly, In some instances in the apex of the lungs are found simply masses, fibrous and cellulo-fibrous, with firm cartilaginous intersections, without cavity, and without permeable bronchial tubes.

From these several facts it is inferred, *1st*, that the cavities now mentioned were tubercular cavities, emptied and partially or wholly cicatrized; and *2d*, that the solid firm portions are cavities in which great or complete contraction had taken place.

SEMIOGRAPHY.—The symptoms of consumption, though very similar in the advanced stage of the disorder, vary somewhat in the early stage, and according to the different modes in which the disease makes its approach.

1. It may come on slowly, gradually, and insidiously. An individual, most usually young, that is between the sixteenth or eighteenth, and twenty-fifth year, begins to lose flesh, and to have

short tickling cough, at first dry, or with only a very small quantity of mucus. At the same time, the cheeks are often the seat of hot uneasy flushings, while the feet are cold, and towards morning he feels a little more moisture than usual on the surface, especially about the head, neck, and breast. The pulse is either considerably quicker than usual, varying from 90 to 110 or 120, or, if occasionally natural, is very readily accelerated; and it has a slight degree of tension and harshness in its beat; while the skin is dry, harsh, and rather hotter than usual. The respiration is in general more frequent in a given time than usual, being from 24 to 28 in the minute, and is easily accelerated either upon moving, walking, or any exertion. Thus, when the manner in which it is performed is observed, it is remarked, that inspiration is short and limited, or speedily checked, and quickly succeeded by expiration, and that the patient cannot take a full or deep inspiration without uneasiness, and without inducing coughing.

As these symptoms advance, the matter expectorated becomes more copious and consists of mucus of different kinds, with frothy saliva; part being semitransparent and floating in water, part more opaque, partially sinking, and part grayish-coloured granular matter aggregated together, and generally enveloped in thick mucus, from which it is only detached by long maceration in water.

At the same time, the complexion becomes pale, sometimes dingy, sallow, or earthy; in other instances, with the paleness is conjoined slight redness of the cheeks, especially when the patient becomes warm; and in young persons, especially females, the countenance acquires a peculiar delicacy of expression.

2. Another mode in which the disease makes its approach is after a neglected cold, as it is named, that is an attack of catarrh, or symptoms of bronchial inflammation, in general slight, and which has been allowed to proceed for some time uncontrolled, or aggravated by fresh exposure to cold. In such circumstances, cough, which was at first moderate and unfrequent, becomes urgent, and recurs often, with considerable shortness and frequency of breathing; expectoration also ensues, and from being at first thin, semitransparent, bluish, and jelly-like, becomes thick, opaque, dense, and puriform. The pulse at the same time becomes rapid, and is seldom under 100, varying from that to 110 or 116, with some tension and sharpness

in the beat. The skin is hot and dry when in bed, but inclined to be cold, when the patient is up and moving about. At length partial moisture is observed about the head, neck, and chest in the morning; and gradually hectic fever with progressive wasting is established.

3. A third mode in which the disease commences is with very moderate symptoms of an obscure and almost latent disorder of the lungs. The patient has cough so slight that it is scarcely noticed, and often entirely eludes observation. The breathing, however, is both more rapid, more frequent, and more limited than natural. The patient cannot take a deep breath without a feeling of oppression; and the attempt sometimes induces cough. Inspiration is hence very short, and speedily follows expiration. Expectoration either does not take place, or it is so scanty that it does not attract attention; and even when the patient is pointedly interrogated regarding it, his answer is, that he brings up nothing by coughing. The pulse is nevertheless, quicker than natural, generally about 90, 92, or 96, is easily accelerated, and beats with a tense compressed stroke on the finger. The patient also has night-sweats, and sometimes is easily chilled during the day.

If in this state blood be drawn from the arm, it is invariably buffy, sometimes covered with a thick coat, and the surface is strongly cupped.

If, in this state also, the chest of the patient be examined, the respiration is found to be from 30 to 34 in the minute; to be short, limited and bronchial; inspiration is short; and an obscure dull creaking sound is heard at its close, especially in the subclavicular region before, and the scapular and the subscapular regions behind. The voice is also a little more resonant than natural; and the beats of the heart are transmitted to the ear with unusual distinctness.

As I have observed in cases of this description, temporary recovery from the most urgent symptoms take place under the seasonable use of antiphlogistic measures, I think this form of the disorder is of the nature of chronic pneumonia.

4. In another description of cases, the first symptom which attracts attention is more or less hæmoptysis; and the consumptive symptoms are then believed to follow after the state of the lungs indicated by the presence of that disorder. But whenever one or more attacks of hæmoptysis appear to be fol-

lowed by symptoms of pulmonary consumption, it will in general be found that the pulmonary hæmorrhage was preceded by other symptoms, indicating a diseased state of the lungs, and that the discharge of blood is a symptomatic effect of the morbid state of these organs.

These morbid states may be various, and several of them have been already shortly adverted to. One of the most usual is that in which all the symptoms enumerated in the last mentioned mode of approach take place. Thus the pulse is habitually or constantly quicker than natural; the respiration is quicker than natural, limited, and easily accelerated and rendered laborious on any exertion; cough is generally observed, short, tickling, and sometimes induced in violent paroxysms; the skin is also dry and harsh, but liable to be profusely but partially moistened during night or towards morning; and the urine in general upon cooling deposits a copious brick-coloured sediment.

On stethoscopic examination, it is found that respiration is bronchial, sometimes with sonorous rhonchus and sibilous wheeze; and fine mucous rattling is heard in the upper parts of the chest, viz. the subclavicular, or pectoral, or axillary, the scapular or subscapular regions; while in the inferior regions the sounds are more natural.

Commencing in any one of the modes now specified, the disease very soon assumes its peculiar and characteristic symptoms, and preserves these more or less closely to the last. Several of these symptoms have been already noticed; but I shall attempt more accurately to appreciate their degree and comparative prevalence in the different stages of the disorder.

The characteristic symptoms may be regarded as cough, with scanty or abundant expectoration, quick breathing, often with a sense of oppression or tightness in some part of the chest, and liable to be aggravated by exertion or motion; hectic fever; latterly, diarrhœa; and more or less pining or wasting through the whole course of the disorder.

The disease has been distinguished as to its symptoms into the early or incipient stage, and the confirmed stage. Laennec and Louis distinguish it into the first stage, or that anterior to the softening of the tubercular masses in the lungs, and their expulsion by the bronchial tubes, and the other subsequent to that process.

The symptoms of the early or incipient stage correspond much to those already mentioned in describing the different

modes in which the disease makes its approach, and they consequently do not require to be again enumerated.

1. Cough is certainly the most constant symptom of phthisis. It appears early and is never totally wanting. It varies much both in kind and degree. In the early stage of the disorder, it is generally short, frequent, and tickling, almost always dry, yet occasionally attended with scanty jelly-like or frothy expectoration. When the disease commences with inflammatory symptoms and much fever, cough is almost constantly a severe and urgent symptom, causing the patient much distress, interrupting sleep, and usually requiring the use of opiates. In those cases in which the disease comes on more insidiously, with less febrile disorder, cough is less urgent and troublesome, and is sometimes so slight for weeks or months that it either attracts no attention, or the patient makes no complaint of it. As the disease advances, cough always becomes more urgent and troublesome, and is a great source of distress to the patient. When it is attended with much expectoration, it is almost incessant, and consists of frequent tickling, and the constant feeling of the necessity of expectoration.

Cough is also violent in the young and vigorous, and in those not much wasted by the distemper. But as the disease approaches to its termination, the strength is so much impaired, that the patient is no longer able to cough. The breathlessness is then much increased; in general, the sense of oppression and tightness is aggravated; and the respiration is rendered more frequent and laborious.

In most instances in which the cough is short and tickling, or even hacking, whether with or without expectoration, the sensation which renders it necessary, or what may be termed the sense of the need of coughing, is referred not to any part of the chest, but to the larynx, or to the windpipe; and so distinct is this sensation, that many patients are convinced that their disease is seated not in the lungs, but in the windpipe. In such cases, however, it is always found that, though the laryngeal or tracheal membrane may be red and roughened, the main cause of the cough is seated farther down, in the form of tubercular infiltration or excavation of the lungs.

The reference of this sensation to the larynx and windpipe depends on two causes. *First*, the sensibility of the part in which the disease is seated is much lower than the sensibility

of the windpipe and larynx, especially the latter; and hence when the irritative impression is applied, or rather is acting constantly on the lungs and bronchial tubes, the impression causes itself to be felt, or its characteristic sensation to be produced only at the larynx, where the membrane is sufficiently sensible to obey or respond to the impressions. *Secondly*, in cases especially in which considerable expectoration of dense mucous or puriform or granular matter takes place, the presence of these substances in the tracheal and laryngeal cavity, and applied to the mucous membrane, maintains there an incessant irritation, the effects of which are most conspicuously displayed where the membrane is most sensible, that is, in the neighbourhood of the larynx.

2. *Expectorated Matter*.—Though the cough is at first dry, or without expectoration, and though in certain forms of pulmonary tuberculation, as the miliary or disseminated, expectoration is either scanty, or does not take place in what might be termed an appreciable degree; yet in the majority of cases of pulmonary tuberculation, matter of various characters is brought up by coughing or expectoration.

In the early stage of the disorder, the matter expectorated is mucus of various degrees of consistence. It may be merely opaque, or heterogeneous, part being opaque, and part semi-transparent, aggregated with, or involving the former. When opaque at this stage, it is commonly of a greenish white tint, and is popularly known by the name of gross matter. When ejected in any receiving vessel, it assumes a rounded or orbicular shape, not unlike a small coin or piece of money, and may then be said to be nummuliform or nummular. When spit into a vessel containing clear water, it is prevented from assuming this flattened rounded shape, and it then appears like irregularly globular or spherical masses, at first buoyant, afterwards sinking more or less completely, like clouds, or compared sometimes to rolled balls of cotton. These masses are not miscible with water, and generally retain their shape for a considerable time, that is, for days after they have been expectorated. They consist not of purulent matter, although it has been often said that at this stage of the disease the expectoration is purulent, and that purulent expectoration is characteristic of the presence of pulmonary consumption. They consist, however, of a species of thickened puriform mucus, which proceeds partly from the softening of tubercular masses, but in a larger

proportion from the surface of the inflamed bronchial tubes in the neighbourhood.

The matter now described is expectorated chiefly during that period when the tubercular masses are breaking down, and when they are undergoing the process of being converted into cavities, or what are called *vomicæ* of the lungs. When the tubercular masses have been completely softened and expelled, and cavities are completely formed, the matter expectorated becomes less abundant, and changes its characters; it no longer presents the globular or ball-like shape, but is often merely a thickened opaque mucus, which in water is flattened out like the matter expectorated in ordinary bronchial inflammation.

3. *The Phenomena afforded by Respiration.*—The breathing is always more or less hurried, that is, the individual breathes a greater number of times in a minute than in a state of health, the respiratory motions amounting, upon an average, from 26, to 28, or 32 in a minute. This accelerated respiration may not be very conspicuous when the patient is at rest or not exerting himself; but whenever he moves about, walks rapidly, or attempts to ascend an acclivity, the breathing becomes quick and panting, and the patient is speedily rendered breathless. In some instances, the rapid breathing is observed when the patient is at rest; but this chiefly occurs in cases in which there is much fever, considerable pneumonic inflammation, and in the early stage of the disease.

When the mode in which respiration is performed is observed, it is seen that inspiration is short; in other words, that the air inspired is no sooner inhaled than it is speedily expelled; and the duration of expiration is generally greater than that of inspiration.

When the chest is examined by percussion and auscultation, various signs are furnished, according to the stage of the disease, that is, according to the state in which the different parts of the lungs are.

Percussion upon the collar bone, especially near its middle and towards its sternal end and over the whole subclavicular region, elicits a duller sound than natural; and often the sound emitted by one side is duller than that emitted by the other. This is occasioned by two different circumstances; *first*, extensive pleuritic exudation over the apex of the lung, with adhesion of the pulmonic to the costal pleura; *secondly*, tubercu-

lar deposition and consolidation of the lung, which is always most extensive and complete at the apex. Percussion elicits a clearer sound in general in the mammary and submammary regions, and in the latter it may be preternaturally clear or tympanitic. In the arm-pit, and in the scapular and subscapular regions, it is generally dull in the early stage of the disorder. In the advanced stages of the disorder, when tubercular cavities have been formed in the subclavicular or axillary regions, it becomes clear.

The signs afforded by auscultation vary also according to the stage of the disorder. In the early stage of the disorder the air is heard to enter the large bronchial tubes, giving rise to occasional sonorous rhonchi and sibilous wheezing, but to be instantly thrown back without penetrating the smaller bronchial tubes and their final extremities. The respiration is then entirely bronchial. The voice also is a little resonant in the subclavicular regions before, and the supra-spinal region behind. But by far the most certain and uniform symptom is the unusual distinctness with which the beats of the heart are transmitted through the stethoscope to the ear. This phenomenon, which is observed early, and continues throughout the whole course of the disease, indicates with more certainty than any other, I think, the presence of tubercular induration of the lung.

In the early stage also, before cavities have been fully formed, sonorous *rhonchi* and sibilous wheezing are heard first, then sibilous wheezing with moist mucous rattling. The sound of respiration is totally different from what it is in the healthy state. It is more or less dull, generally completely so; and, either during inspiration or at its close, there are heard the sounds of the moist crepitating rattle, or the fine mucous rattle, or both combined, in the subclavicular or mammary region before, the axillary region at the side, and the scapular region behind. In the same points also, that is, the subclavicular, the axillary, or the supra-spinal behind, and sometimes in the infra-spinal, there are heard at intervals a sort of cooing sound, and sometimes a weeping or sobbing noise. It is difficult, if not impossible, to say on what exact state of the parts these sounds depend; but they are always associated with more or less softening of parts which had been previously occupied by tubercular deposition. It is probable that the weeping noise is

caused by fluid moved to and fro in the motions of respiration, and that the cooing noise is the effect of air impelled either from a bronchial tube into a small and imperfect cavity, or from the latter into the former.

In a short time, that is, in the course of from five to ten days, these sounds increase in intensity, and as it were coalesce, so that in one space, varying from half an inch to an inch in diameter, the ear recognizes a gurgling sound, as if of air moved and agitated with fluid in a cavity. This sign, to which the name of fluid or mucous gurgling has been given, indicates that one or more tubercular masses have been softened into fluid or semifluid matters, and are ready to be coughed up by expectoration. In the course of a few days more, this symptom undergoes a modification. It is observed that during inspiration, air is heard to enter the space, and if the patient coughs or speaks, a peculiar re-echoing sound is heard. The sound produced by the former is denominated cavernous respiration, because the air enters into, and issues from a part which is hollowed and partially filled with air. In cavernous respiration, in short, a considerable and rather intense blowing or puffing sound is heard under the bell of the stethoscope.

Cavernous respiration may be partial or complete. In the first case it is not much more intense than the usual strong bronchial respiration; and with this, indeed, it is liable to be confounded. In the second case, at each motion of respiration, the air is perceived to enter a hollow space with a blowing sound; and if the patient cough or expire strongly, a resounding vibratory motion is communicated to the ear.

When the patient speaks, the sounds are rendered still more intense, and are transmitted still more distinctly to the ear through the stethoscope. At each laryngeal sound, the voice, or the sound of the voice, vibrates with a hollow thrill, more or less deep, at the part, and seems to come directly from the chest, through the stethoscope to the ear. Such a phenomenon is named pectoriloquy, (*pectoriloquium*), because the voice of the patient seems to issue as it were from the chest.

Pectoriloquy may be doubtful, or indistinct as to its character; that is, the voice seems to come in certain tones, but not in others, from the chest to the ear. It may be partial, that is, heard only at certain parts, and not at others. It may be imperfect, that is, in degree, which takes place chiefly before the cavity is

thoroughly emptied. And it may be complete or perfect, that is, the voice is heard to come altogether through the stethoscope to the ear.

The most usual spots for the phenomena of doubtful, indistinct, partial, imperfect, or perfect pectoriloquy, are the space below the collar bone anteriorly, (*regio subclavicularis*), especially opposite the middle of the bone, and about from three-quarters of an inch to one inch below it; the arm-pit or the axillary region at the side; and the supra-spinal region, or the upper part of the infra-spinal region behind.

The extent over which pectoriloquy is heard varies according to the size of the cavity, its being partially or thoroughly emptied, and its being one large cavity, or consisting of several small or moderate-sized communicating caverns. Most commonly it is complete, and heard over the space of one inch at least, in the subclavicular region of one or other side of the chest, and in the axillary region. Whenever it is so heard with distinct cavernous respiration, no doubt can be entertained of the presence of a pretty large cavity in the apex of the lung.

By one circumstance, however, the indications given by this symptom may be either neutralized, or rendered indistinct, or impracticable to be obtained. In those cases in which hoarseness, a common symptom, is so great as to constitute *aphonia*, it is impossible to make the voice re-echo within the chest with sufficient intensity to develope the symptom.

4. *Hæmoptysis*.—This has been so often mentioned as a cause of consumption, or a symptom in some part of its course, that it is very generally associated with the distemper. *Hæmoptysis*, as it takes place in consumption, may be scanty, merely streaking the expectoration (*hæmoptoe*); or moderate, that is, two to three tea-spoonfuls; considerable, that is from one to three or four ounces; or profuse, from six ounces to a pound, (*pneumonorrhagia*). In the first two cases it may proceed either from the bronchial membrane or the breaking down of a tubercular mass; in the other two cases, it may proceed from vessels involved in tubercular destruction; or from the lungs, the vessels of which are gorged, and their blood prevented from moving by the great encroachment on them, caused by the tubercular masses.

Hæmoptysis, in one or other form, takes place, according

to Louis, in two-thirds of cases of pulmonary consumption; and violent hæmoptysis in about five-seventeenths of the cases. From these facts, M. Louis regards the occurrence of hæmoptysis as rendering the presence of tubercles in the lungs highly probable.* No fact, nevertheless, is better established than that cases of hæmoptysis take place which do not terminate in consumption; and in various cases of consumption, the disease proceeds from its origin to its termination, without a single particle of blood having been expectorated. In the Royal Infirmary of Edinburgh it takes place, as shown by numerical returns, in about one-fourth of the cases.

It is more frequent in females than in males.

Hæmoptysis appears in different modes at different stages of the disorder. When it appears as the first symptom, that is, the first manifest symptom, it is often considerable, or even profuse; and there is strong reason to believe that it then depends upon vascular congestion of the lungs, and impeded circulation, similar to that which takes place in pneumonia, and, perhaps, occasionally similar to that which is the effect of disease of the left ventricle of the heart. When it takes place to considerable amount in the course of the disease, and especially after distinct symptoms of tubercular excavation, it most usually depends on the erosion of vessels not obliterated, or imperfectly closed. In the course of the disease, it is most usually seen in the form of opaque jelly-like mucus, streaked with blood, or in that of small quantities of blood mixed with the matter expectorated.

5. Hoarseness (*Raucedo*, *Raucitas*; Heiserkeit,) sometimes to a considerable degree, with or without a feeling of rawness and soreness in the throat (*larynx*), and breast (*trachea*), is a symptom that takes place in a considerable number of cases of consumption, at least one-third, especially where the individual, as among the working classes, continues to go about and expose himself to atmospheric vicissitudes. Sometimes there is pain in the site of the cricoid cartilage, or in that of the ary-

* The language employed by M. Louis on this subject is something obscure. He states that hæmoptysis, whenever it occurs, renders the presence of tubercles in the lungs infinitely probable (*infiniment probable*). What degree of probability the infinite is, I really do not understand; and some more precise expression might have been expected from one who has spoken with severity of the vague and indefinite language of others.

tenoid cartilages, or a sense of rawness, soreness, and roughness, extending down the windpipe. The hoarseness varies in degree from mere roughness to complete extinction of the voice, (*aphonia*) ; and so violent and complete is it in some severe cases, that a case of pulmonary consumption has been mistaken, in consequence, for a case of chronic laryngitis or laryngeal phthisis, and remedies accordingly directed to be employed.

6. Pain is not a very common or constant symptom of tubercular deposition in the lungs. In the early stage of several of the inflammatory and congestive or hemorrhagic forms of the disorder, pain is felt sometimes in particular parts, as the mammary region before, or the scapular behind, or at the lower angle of the scapula ; and, in some instances, the patient feels a painful sense of weight and oppression, preventing deep or full inspiration, and usually aggravated by the attempt. But this cannot be said to be even a general symptom ; and much more frequently, patients, when strictly interrogated, answer that they have never experienced pains in any part of the chest or side.

When pains in the sides or in any part of the chest are felt, in the majority of cases, they indicate the presence of more or less pleuritic inflammation, more especially if they be continuous, enduring, and pungent.

The most usual position for pains to be felt by consumptive persons is between the shoulders or the interscapular space, and especially towards the close of the disease, at the lower extremity of the sternum, and extending thence on each side. The former variety of pains seems to depend on the irritation induced in the lungs, reflected by a species of sympathy, probably nervous, to the interscapular space. The latter are manifestly caused by fatigue and labour of the diaphragm in the incessant irritation of coughing.

Pains depending on pleuritic inflammation may come on at any period of the disorder, but are more frequent in its progress, after the tubercular masses have begun to be broken down and softened, than at earlier periods of the distemper. When pain comes on gradually and continues some time, it indicates the presence of one of those pleuritic attacks already mentioned, as induced by the progressive softening of a considerable tubercular mass, and the approach of the cavity to the pleura. When

pain comes on suddenly, and is acute, tearing, and intense, after cavernous respiration or pectoriloquy has been heard for some time, and more particularly if the sound emitted by percussion be clear, there is every reason to believe that it depends on perforation of the lungs. In this case, however, the acuteness of the pain ceases often in the course of six or eight hours.

7. *Fever*.—The majority of cases of consumption are attended with febrile symptoms, which vary in character at the different stages of the distemper. Thus, in the early stage, it has usually more of the character of inflammatory or symptomatic fever, of various degrees of intensity. The pulse is quick, (90–100–120), sharp, but oppressed, and when the patient is warm in bed, it is full and strong. The face is pale when the patient is out of bed, and the features cling to the bones; but when the patient is warm, it becomes flushed, with redness of the cheeks. The skin is dry, and rather harsh, and the extremities prone to be cold; but during the night, and towards morning, it is either generally moistened with vapour, exhaling a sort of acid odour, or the head, neck, and breast, are profusely covered with fluid drops of perspiration, while the extremities are scarcely moistened.

Distinct shivering fits or rigors are felt in a considerable number of cases, three-fifths, at least, and would probably be recognized in a much greater number, were it not that patients do not apply for assistance until the first stage of the disorder is over. Shivering fits usually come on about twelve at noon, or between that time and half-past two. The cold or shivering fit lasts from half an hour to three-quarters; during which the patient is pale and cold, and the features are contracted; it is then succeeded by a hot fit, in which the features become fuller, and the skin warm, with a strong, full, rapid pulse; and as it advances, the cheeks become red or even pink; and a pink spot is very generally observed on one or both cheeks. Then gradually, but speedily follows, about two hours from the first shivering, a sweating stage, in which sweat flows as already mentioned. In some instances, the rigors are most distinct during the day, and the sweatings during the night.

During the whole of this period, which may last for a month, six weeks, or two months, blood, if drawn, presents a firm, thick, buffy coat, and is in general firmly cupped.

This feverish state becomes more moderate after a certain

time, viz. the lapse of two or three months ; but the pulse continues more or less rapid, and is in general smaller than natural, and feeble. Very generally the abatement in the intensity of the febrile symptoms is connected with the completion of softening, and excavation of the tubercular masses.

Positive rigors are wanting in about one-sixth part of the cases ; but in the whole of them the patient has wandering sensations of cold.

In some instances, the fever presents at its first appearance, and for several days, the characters ascribed to *Synochus* or even *Typhus*.

8. *State of the Alimentary Organs.*—In the early stage of the disorder, when rigors and much fever are present, it is not uncommon for sickness and vomiting to take place either during the cold stage, or about its commencement. The appetite, nevertheless, is not much impaired ; and the patient often takes food with much eagerness and enjoyment. The tendency to vomit vibrates, and finally ceases as the progress of the distemper advances from the inflammatory to the softening stage. But the appetite, instead of being impaired, is often increased, and the patient feels a frequent desire to eat, though he eats little at once.

Diarrhœa is a symptom so common in consumption, that it may be regarded as an essential symptom of the disorder. In about one-third of the cases, it comes on in the early stage. In the majority, that is, between three-fourths and seven-eighths, it takes place in the second stage of the distemper, when the softening of the tubercular masses is well advanced. In a small proportion, it takes place at the close of the disease ; and in a very small number, that is, about one-twenty-second of the cases, it does not appear at all. In all these cases, it depends either on inflammation of the intestinal mucous membrane, and its follicles, or on their ulceration. At its commencement, it seems to be the effect of inflammation ; but when it has recurred often, and continued long, it depends on ulceration either of the ileal or the colic follicles.

It is rarely constant, unless towards the close of the disorder. At first, it comes on and lasts several days, being chiefly an inconvenience, and subsides of its own accord, or under the use of some change in diet, or the employment of opiates. Very soon, however, it recurs in a form equally or more ur-

gent, and, though capable of being moderated by medical or dietetic measures, never completely subsides, but continues to the close of the distemper. In general it is sensibly aggravated by the use of animal food, malt liquor, or the free use of food in general. When it abates, the sweats are uniformly more profuse.

This symptom, when long continued, is always connected with ulceration of the ileum or of the colon. When the symptom is continuous, or without intermission, the ulcers are in general large; when it is remitting, or interrupted, the ulcers are usually small.

In some instances, that is, about one-fourth of the cases, diarrhœa does not come on till between the fiftieth and the twentieth day before death. In this case, it is regarded as peculiar, and has been named the diarrhœa of the concluding days. This form takes place in one-fourth of the cases. In one-half of them it is connected with ulcers of the ileum or colon, or both, and in four-fifths with a softened and reddened state of the colic mucous membrane.

9. Wasting, which is the most constant and obvious symptom of consumption, begins in a considerable number of cases, that is, one-half, with the first symptoms; in a small proportion with the diarrhœa; and in one-third part with the fever. It depends partly on the sweating, partly on the diarrhœa, and the morbid state of the gastro-enteric mucous membrane; but in a greater degree on the change in the pulmonic tissue, and the consequent diminution of the function of respiration, and the lesion thereby induced in the process of nutrition.

10. Oedema of the feet is common at the close of the disorder.

11. In the concluding stage of consumption, when the emaciation is extreme, the thoracic parietes seem to undergo a manifest contraction. They are more or less flattened anteriorly, especially in the subclavicular and mammary regions. The shoulders also become elevated towards the ears, and drawn forwards, and the whole thorax is contracted, especially at its superior regions. Part of this may be owing to the great wasting of the muscles; but a great deal is due to the contraction which the walls of the chest, both osseous and muscular, undergo, in consequence of the excavations of the lung, and the pleuritic adhesions. After the tubercular masses are much or

wholly excavated, a tendency to contraction and shrinking takes place, partly by the pressure of the incumbent parts, partly by atmospheric pressure.

Such are the chief symptoms of pulmonary consumption. It sometimes happens that one or two of these phenomena are either wanting for some time, or are not developed so distinctly as they usually are; or do not appear in the usual order; and hence cases of consumption appear to proceed to within a few weeks of the fatal termination, without the true nature of the disorder being recognized. Thus, in some cases, expectoration is either scanty or not observed; in some cough is very moderate; in some cases little or no fever is observed; and in some all the symptoms seem to be lost or overlooked in the diarrhoea, which is the only complaint for which the patient applies for assistance and relief. Such cases have been referred to the head of *latent* consumption, which are represented by M. Louis to be so numerous as to form one-eighth of the whole number. The accuracy of this conclusion I see great reason to doubt; and I question altogether the existence of such a form as latent consumption. I have often seen cases in which the symptoms were obscure, and were consequently overlooked; and I have seen cases in which the wasting was ascribed to chronic *laryngitis*, to asthma, to *marasmus*, to *tabes*, to chronic diarrhoea, and even to dyspepsia. But all these were examples of errors in diagnosis, depending either on the deception of patients and their friends, or the credulity and carelessness of physicians; and when the symptoms and state of the patient were carefully investigated, the nature of the case became manifest. While, therefore, I allow that the symptoms are liable to be obscure in character, and irregular in order, I do not admit that there is such a distemper as latent consumption.

To the principle now specified, I admit only two exceptions, which, when duly considered, are confirmations. The first is, that cases of disseminated miliary tuberculation do not give rise to all the true symptoms of pulmonary consumption. They induce breathlessness (*dyspnœa*, *asthma*), and occasional cough, but seldom expectoration or hectic fever; and the expectoration is either scanty, or merely viscid jelly-like mucus. Most usually they induce peripneumony, sometimes serous effusion into the pleural cavities. The second exception is, that cases of tyromatous deposition do not necessarily

or of themselves, induce cough, puriform expectoration, or hectic fever. Occasionally, but not always, they cause breathlessness (*dyspnœa*), by compressing one or more of the bronchial tubes, or even solidifying part of the lung. But unless an attack of acute inflammation is superadded, or they are complicated with the presence of tubercular masses, no true phthisical symptoms ensue.

Consumption is liable to be complicated or associated with other lesions. The most important complication in this country is that of spurious melanosis, or the black and carbonaceous infiltration of the lung. In coal-miners, and in quarrymen working in coal mines, the lungs are liable to become not only tuberculated and excavated into cavities, but infiltrated with true carbonaceous matter. The expectoration is then tinged black during life; and after death, the lungs are found completely blackened, and pouring out large quantities of dark-coloured fluid, the colouring matter of which is known to be carbonaceous matter in a very minute state of division. *

DIAGNOSIS.—Consumption must be distinguished from chronic pleurisy, chronic *bronchitis*, and chronic pneumonia; from *tabes*, marasmus, ulceration of the intestinal tube, and dyspeptic disorders.

ETIOLOGY.—Nothing is more puzzling than the question of the causes of consumption, and the circumstances on which its prevalence depends; and though very elaborate inquiries have been made by many authors, the results are very contradictory.

1. *Sex.*—As to the influence of sex, it is now ascertained that it appears to be null; as the larger proportion of females shown to be affected by the distemper, by the reports of Paris and Berlin, is neutralized by the greater prevalence of the disease among males in Hamburgh, Rouen, Naples, and Geneva. In the Royal Infirmary of this city, the disease is more prevalent among males than among females, in the ratio of 3 to 2,—three-fifths being men and two-fifths women.

2. *Age.*—The greatest number of deaths from consumption takes place between 20 and 30; the next between 30 and 40; and the next between 40 and 50.

* On Black Expectoration, and the Deposition of Black Matter in the Lungs, &c. By William Thomson, M. D. in *Medico-Chirurgical Transactions*, Vol. xx, 1837, and xxi. 1888.

3. As to occupation, those engaged in pursuits in which the individuals are exposed to the exhalation of minute but irritating mechanical powders, suffer much. Such are hewing masons and quarrymen in this city, quarrymen in the mines of Waldshut, and the labourers in the quarries of St Roch, needle-pointers, cast iron filers, fork and knife-grinders, feather-dressers, brush-makers, flax-dressers, leather-dressers, and similar workmen. Persons exposed to atmospheric vicissitudes, as soldiers, seamen, bakers, and similar labourers, also suffer much from this disorder.

4. Climate has been long supposed to exercise great influence on the production of consumption; but it has never been possible to ascertain precisely the kind of climate which is most favourable or most pernicious. Cold, and especially variable climates, have been supposed to be much more prolific of consumption than warm and steady climates; and in this manner it has been usual to explain the great prevalence of consumption in the British islands.

In London, while the number of yearly deaths from all diseases is at the rate of about 20 or 19 per thousand, that by consumption is from 6 to $6\frac{1}{2}$ per thousand. It is further remarkable, that while the mortality from all other diseases has decreased in the space of 120 years, from 1700 to 1820, that from consumption during the 50 years between 1700 and 1750, has increased from 4 per thousand to $6\frac{2}{3}$, and has never been under 6 per thousand. According to the numbers of the bills of mortality from 1830 to 1835, it is ascertained that among 1000 deaths among the civil population in general, 177 are by consumption. The mortality by consumption is certainly much higher numerically than that by any other disease in this country, excepting typhous fever. Among a total amount of 331 deaths in a large Assurance Office in London, (the Equitable,) 122 were produced by consumption, or at the rate of 7.7 per thousand, the total mortality being at the rate of 15.3 per thousand; which shews that, among that class of society resorting to insurance offices, the mortality by consumption is as nearly as possible one-half of the whole.

From the first report of the registrar-general, it results that, during the half year ending 31st September 1837, the deaths by consumption in England and Wales were 27,754, the total amount registered being 148,702; making a mortality of 20 per

cent. by consumption, or nearly 4 annually, among 1000 living:

This large mortality varies much in densely and thinly peopled districts; and the mortality by consumption in towns is much higher than in rural districts. Thus it appears that, during the same period, the mortality by consumption in the counties was 5857, whereas in the cities or towns it amounted to 8126. This gives an increase for the latter of 39 per cent.

It appears also that the mortality varies in different regions of the metropolis. In ten districts in the east, on both sides of the river, from Bethnal Green on the north, to Bermondsey and Rotherhithe on the south, the mortality by consumption is 14.4 per cent. that is in 100 deaths, and among 100 living .478, that is nearly five-tenths. In ten districts on both sides, embracing the Strand, Westminster, St Martin in the Fields, and Clerkenwell on the north, and St Olave, St Saviour, St George, Greenwich, and Newington, on the south, the mortality is 15.8 among 100 deaths, and among 100 living, .451, that is nine-twentieths. And in other ten districts embracing chiefly the west end parishes, the mortality is 16.4, among 100 deaths, and among 100 living, .354, that is, about seven-twentieths. The first ten are regarded as unhealthy districts; the last ten as healthy.

These numbers interpreted show that, when deaths by consumption, compared with the total deaths, are numerous, the absolute mortality is low, and that the mortality from consumption is also low.

Fatal, however, as this disease is in civil life, it appears to be still more injurious to soldiers; and especially to particular classes of them. Thus it appears that diseases of the lungs, and of these four-fifths at least are consumption, produce among the Dragoon Guards and Dragoons a mortality at the rate of 7.7 per thousand, among a total mortality of 15.3 per thousand. In other words, pulmonary diseases, of which consumption forms four-fifths, produce nearly one-half of the whole mortality. Among the Foot Guards this destruction is still greater. The deaths by pulmonary diseases amount to the proportion of 14.1 per thousand, while the mortality by other diseases is nearly the same as in the Dragoon Guards and the Dragoons. This large increase, which is nearly double of that which takes place in the Dragoon Guards and Dragoons, raises the total mortality in the Foot Guards to 21.6 per thou-

sand, which is the highest rate of mortality among troops serving in this country.

Among the different regions of the globe in which British troops are serving, the prevalence of consumption among that class of men varies very much. The following statement may communicate some idea of the variable degree of this prevalence in different parts of the world. The numbers show the rate per thousand suffering under, or attacked by symptoms of consumption;—Jamaica Command, 13; Windward and Leeward Command, 12; Bermuda, 8.8; Gibraltar, 8.2; Malta, 6.7; Ionian Islands 5.3; Canada, 6.5; Nova Scotia and New Brunswick, 7; Cape district, 5.5; United Kingdom, 6.6 Mauritius, 7.7. These numbers show that the places most productive of consumption are the West India Islands, viz. Jamaica, the Windward and Leeward Command, and Bermuda; Gibraltar and the Mauritius; that the places least productive are the Ionian Islands and the Cape of Good Hope; and that intermediate between these are Canada, Malta, the United Kingdom, and perhaps Nova Scotia and New Brunswick.

This conclusion must not, however, be understood altogether without exception. Though it results that the climate of the West Indies, as operating upon the constitutions of private soldiers, appears to be highly productive of consumption, yet that it is not the climate alone, must be inferred from the fact, that the proportion of officers attacked by this distemper in that station is infinitely smaller than that of the private soldiers. The same holds true with regard to officers at Gibraltar.

It seems reasonable to conclude from all these facts, that exposure to cold is the main cause of the production of consumptive disorders.

It is next an important question to determine the mode in which these remote causes induce the disorder. A very common and general opinion has been, that it is by inducing inflammation that consumptive symptoms are developed; and this idea has been more or less forcibly and decidedly adopted by Dover, Sir John Pringle, Dr Donald Monro, Cleghorn, Tissot, Stoll, Portal, Thomas Young, Broussais, Schroeder, Andral, and Alison. It has always, however, been more or less strongly opposed by the fact, that inflammation of the lungs attacks many persons without giving rise to pulmonary consumption. The strength of this argument is believed to be augmented by the

researches of Louis, who states, that, among 80 cases of consumption, in 7 only were the symptoms preceded at a considerable interval by an attack of pneumonia; and among the same number of cases, only 23 were subject to catarrhal symptoms. Another argument, which is conceived to militate against the idea, that consumption originates in inflammation, is derived from the anatomical fact, that in pneumonia the lower part of the lung is first and most severely attacked; whereas in consumption it is the upper region of the lung that is attacked first and most severely.

These circumstances have led several pathologists to look for the origin of consumption in a cachectic state of the system, or a state of deranged health, in which, after some time, the lung becomes the seat of this morbid deposition. This opinion has been very ably maintained by Sir James Clarke, to whose work I refer for the arguments by which it is supported.

My limits do not allow me to enter into the detailed consideration of this question; but I think the following remarks may tend to its illustration.

1. In the first place, there is nothing inconsistent in allowing a certain morbid state of the constitution, along with a degree or form of local inflammation. It seems to be presumed in this view, that inflammation is always a healthy or normal action, and that the deposition of tubercular matter is a morbid one. Inflammation, however, is not always an unhealthy action, but it gives rise to unhealthy states, and proceeds from causes which act in deranging the health. Inflammation also assumes different forms; and that which is chronic in progress, and insidious or obscure in symptoms, is, in an especial manner, associated with a disordered state of the system, or rather first of the organ, or its component tissues.

2. The arguments deduced from the unfrequency of pneumonia or bronchitis being proved to be followed by consumption are of no avail, and not applicable to the question. The inflammatory state which introduces and attends consumptive symptoms is neither pneumonia nor bronchitis, but slow or chronic inflammation of the vesicles or terminal ends of the air tubes of the lungs,—in short, a vesicular *bronchitis* or vesicular inflammation, which differs from the ordinary vesicular *bronchitis*, in beginning in the upper lobe, in affecting, not the whole of the vesicles at once, but a few successively and progressively,

in effusing a quantity of viscid, plastic, albuminous matter, and in proceeding much more slowly and insidiously, though steadily, than the usual distemper.

3. That this disorder is inflammatory in its nature seems to be undoubted, if it be borne in mind, that, at its commencement, the blood invariably presents a thick, firm, buffy coat.

4. The same conclusion may be deduced from the fact, that all those mechanical irritants, as steel-grindings, dust of feathers, the minute dust of hewn stones, and similar articles, which are known to produce consumption, act at first by causing vesicular bronchial inflammation.

5. Another argument, not less conclusive, may be deduced from the effects of quicksilver, either injected into the vascular system, or poured into the bronchial tubes. The experiment of injecting quicksilver into the vascular system was first performed in 1694 by Mr Clayton, who found that this mineral, injected into the veins of a dog, was followed by consumption, which was fatal in the course of sixteen weeks. When the lungs were examined after death, they presented many suppurations or abscesses, and in the centre of each a globule of liquid mercury.* In this experiment it is not mentioned in which texture of the lungs the quicksilver suppurations were found; but from what is now known, there is good reason to believe that they were contained in the veins of the lungs.

The experiment was repeated long afterwards in the beginning of the present century, by Dr William Saunders of London. Two drachms of quicksilver were injected, by means of a proper apparatus, into the crural veins of a dog. No obvious effects ensued for a whole day; but afterwards evident marks of increased action in the vascular system took place, with quick hard pulse. Two or three days afterwards, dyspnoea ensued, followed by cough and symptoms denoting affection of the lungs, which increased daily, until the animal died. The lungs on examination were found in a tubercular state; and in making sections of the tubercles, each contained a globule of quicksilver, forming a kind of nucleus to the circumscribed inflammation or tubercle. Many of these tubercles had suppurated and formed vomicae.†

* Philosophical Transactions, xviii. 1694, p. 121.

† A Treatise on the Structure, Economy, and Diseases of the Liver, &c. By William Saunders, M. D., F. R. S., &c. Third edition. London, 1803. Chapter, iv. 56, p. 307.

Whether the quicksilver here was transferred only to the veins of the lungs, or was deposited in their substance, or in the vesicles, it appears quite clear, that each mercurial globule had given rise to a patch of circumscribed inflammation.

Experiments of a more direct nature were performed in 1826, by Cruveilhier, and in 1828, by Dr Kay. The former injected quicksilver into the femoral artery of a dog, which was killed some days afterwards. In the limb were found thousands of little miliary tubercles, regularly formed, and each enclosing a very minute globule of quicksilver. He injected by an opening in the windpipe, two drachms of quicksilver into the bronchial tubes of a dog. The greater part was rejected by coughing. But the animal became phthisical, and died emaciated at the end of one month. The lungs were found stiffened with tubercles, isolated and aggregated, presenting all the characters of miliary tubercles.*

Dr Kay introduced by small incisions a small globule of quicksilver into the windpipe of each of five rabbits. This produced at first much coughing, which returned occasionally afterwards, but did not otherwise cause much inconvenience. The animals took their food well; but their breathing was hurried and laborious. The first rabbit was killed eight days afterwards, and in this clusters of tubercles were found in the lungs, and in the centre of each tubercle a globule of mercury. The others presented granular bodies, tubercles, and more or less of the appearances of inflammation of the lungs.†

The power of inflammation, therefore, in inducing tubercular disorganization of the lungs, can scarcely be denied.

6. One of the strongest arguments, however, in proof of the proposition, that tubercles are the result of inflammation, is deduced from the comparative prevalence of pneumonic inflammation and consumption in the army and navy. Nearly four-fifths of the fatal cases of pulmonary diseases in the army arise from consumption, being as many as from all other causes in the army at home. In the army, the ages of the persons upon whom it falls may be stated between eighteen and forty. The disease in this class of persons is almost invariably inflammatory in origin, or the result of neglected catarrh, or neglected pneumonic or bronchial inflammation. In the navy the deve-

* Nouvelle Bibliotheque Medicale, Sept. 1826.

† Edinburgh Medico-Chirurgical Transactions, Vol. iii. p. 300.

lopement of consumption is not less clearly often attributable to causes which induce an inflammatory state of the lungs.

Upon the whole, it seems to be a conclusion as well established as any in pathology, that consumption is in its origin always an inflammatory disorder.

Consumption is believed in Spain, Italy, and other continental countries, to be contagious. For this notion, however, there are no good grounds; and in this country no sensible physician espouses this opinion. Where two or three cases occur in the same family, the occurrence may be explained by referring to the same constitutional causes, without having recourse to the fanciful idea of contagion.

TREATMENT.—The treatment of consumption should be varied according to the stage of the disorder, and according to the existing symptoms.

I. The great object in the early stage of consumption is, either to prevent, if possible, the formation of tubercles, or, after their formation, to prevent them from becoming softened. It is manifest from all that we hitherto know, that these objects are most certainly and easily attained by the judicious employment of those means which are calculated to allay irritation, and to abate inflammation.

1. In the early or incipient stage, while febrile or inflammatory symptoms are still predominant, while the pulse is strong and quick, whether it be full or oppressed, and before much expectoration has taken place, the most efficacious and safest remedy is blood-letting, at first to the extent of twenty or twenty-five ounces, so as to make some impression on the pulse and the other symptoms, and then several small blood-lettings if the symptoms be still urgent.

In some instances, after the first general blood-letting, local blood-letting, by cupping between the shoulders, is highly beneficial. In those cases in which the respiration is dull, and the voice resonant in the subclavicular regions, the application of ten or twelve leeches over those parts may, by the evacuation which they produce, be beneficial. In other cases, leeches may be applied over the anterior surface of the throat, where the free communication of the cutaneous and the mucous capillaries may tend to empty the latter.

2. At the same time, the bowels should be efficiently emptied by means of eccoprotic laxatives. Purging is not requisite;

but the steady use of eccoprotics, especially if the tongue be furred, and if there be much thirst, is very beneficial. If the same object can be attained by means of dietetic articles, and the mode and time of taking them, it will be more useful than if effected by medicine.

3. After the bowels have been thoroughly emptied, and all foul or morbid secretions expelled, the use of emetics, either in the nauseating or the full dose, is requisite. The employment of emetics has long been a favourite practice in the treatment of consumption; and both in ancient and modern times, they have been employed and recommended with great confidence.

When given in the emetic dose, they are intended partly to counteract or abate inflammation, to promote expectoration, and to determine towards the skin. According to the views of recent authors also, they may either prevent the deposition of tubercular matter, or promote its expulsion. In this form, they should not be exhibited more than once or twice in the week. For this purpose, sulphate of zinc and sulphate of copper, either alone, or with ipecacuan, have been recommended. Marryat recommended as a dry vomit, that is, one which should be taken without drinking after it, one grain of tartar emetic, with about three of ipecacuan, to be taken fasting, twice or three times a week; or, if there be diarrhœa, one grain of sulphate of copper with four of ipecacuan.

In the early stage of the distemper, I believe nothing is better for accomplishing the indication now mentioned than ipecacuan or tartar emetic. The former may either be given in doses of ten or fifteen or twenty grains three times a week, or it may be exhibited as a mere nauseant and expectorant in doses of one grain twice daily. The wine of ipecacuan may be given with the same intention in doses of half a drachm, or one drachm, two or three times daily.

Antimony is most conveniently given as a nauseant, a diaphoretic, and a remedy for abating the congestion of the lungs. The best method is to dissolve four, six, or eight grains in two ounces of water, and give a teaspoonful of the solution, four or five times daily, until the pulse becomes less frequent, the cough less urgent, the breathing more free, and the skin generally moist. After the solution has been given in this manner, for several days, it is convenient to add to it a small quantity, (two, three, or four drachms,) of the solution of muriate of morphia, in which form of combination the medicine is more

readily endured by the stomach, and, at the same time, acts on the skin.

In the advanced stage of the disorder, when the tubercular masses are breaking down, and in the course of being ejected, or when cavities are actually formed, the nauseating remedies are less decidedly indicated, and less easily borne. Their chief use in that state is to obviate bronchial irritation, and to facilitate expectoration. For this purpose, either ipecacuan or antimony may be used in minute doses. But sometimes it is requisite to produce either vomiting or expectoration without much sickness. With this intention, a good combination is five grains of sulphate of zinc, and ten grains of ipecacuan, given in the evening. Sometimes it is not followed by vomiting; but then easy expectoration always ensues after ten or twelve hours.

A very decided derivation from the lungs is produced in the same manner, and more easily, and sometimes more agreeably, by the constant or frequently recurring sickness produced by sailing. Many instances have occurred of persons presenting consumptive symptoms recovering very completely during a sea voyage of two, three, or four weeks' duration; and the remedy has been consequently strongly recommended by Dr Gilchrist and several subsequent authors. When it is determined to adopt the remedy, it is desirable to choose a voyage of sufficient length, embracing probably, at least, a period of five or six weeks, or two periods of four weeks. In various cases, a long voyage, for example, to the Cape of Good Hope, the East Indies, or Australia, might be advisable.

4. Various sedative and diuretic remedies have acquired more or less reputation in the treatment of consumptive symptoms. Of these, perhaps, the most celebrated is foxglove (*Digitalis purpurea*), which has been given by many practitioners, either with the view of reducing the frequency of the pulse, or promoting the secretion of urine. Originally recommended by Withering, its use was more or less generally adopted in the treatment of consumptive disorders, by Darwin, Beddoes, Kinglake, Ferriar, Magennis, and many subsequent practitioners. It may be given either in tincture or in the powder of the dried leaves. The former has been the most usual form; and in this it may be given to the extent of one drachm, or even one hundred minims, that is, five scruples, in the course of the day. Its physiological effects exhibited in this manner are, faintness, sickness, sometimes vomiting, with cold clammy sweats; verti-

go, double vision, ocular coloured spectra, dimness of sight, and a feeling of great faintness and confusion; irregular or intermitting pulse, and at length reduction in its beats, from 20 to 30 in the minute;—bringing it down to 80, 68, or even 40 beats in the minute; and after the sickness goes off, increase in the quantity of urine. The therapeutic effects vary in different stages of the disease. When given in the form of powder, it is good to combine it with opium and aromatic confection, in the proportion of one grain of foxglove powder, to one-fourth or one-half grain of opium. In this combination, the physiological effects act less immediately on the nervous system, and the motion of the heart; and more apparently upon the capillary vessels.

Another remedy, partly expectorant, partly diuretic, consists in the seeds of the water hemlock, (*Phellandrium aquaticum*), the infusion of which is much recommended by Frank, Schroeder, and other German practitioners.

Another agent of a sedative character, which has been much commended, and occasionally employed in the treatment of pulmonary consumption, is hydrocyanic acid. This substance Brera of Padua was in the habit, subsequent to 1809, of administering in pneumonia and other diseases of the lungs, as a sedative or means of restraining excessive action. In 1815, Dr Granville directed the attention of the profession to its administration in consumption, in observations on its use in pulmonary disorders. Brera, in 1816, published reports of the results obtained from its employment in the Clinical Institute of the University of Padua; and Magendie, who tried it in 1815, recommended it strongly in 1817, as a useful remedy in consumptive disorders. Since that time, it has been more or less strongly recommended by Manzoni, Coullon, again by Magendie and Granville, and afterwards by Dr Elliotson.

The hydrocyanic acid is prepared either according to the formula of Scheele or that of Guy-Lussac. The latter is the most eligible; but, as it is too concentrated, it should be diluted with six times its volume or eight times its weight of distilled water; so that the density of this form will be 0.92. The preparation recommended in the Pharmacopœia of the Edinburgh College is that according to the formula of Giese, and consists of hydrocyanic acid of density 0.70, diluted with about thirty parts of water, with probably a minute portion of sulphuric acid.

Of this preparation, the safest plan is to begin with two or three minims, and then to increase the dose gradually to five, seven, or ten minims. It is hazardous to give a large dose at first, because each specimen of the acid may vary in strength, one being powerful, another feeble, according as it retains its composition, or is more or less decomposed. Upon one occasion, seven persons were destroyed in the course of a single day in an hospital in Paris, by this agent prescribed according to the usual rules. The only mode of guarding against such accidents, is to ascertain before prescription the strength of each specimen of the acid.

It is exclusively in the early or inflammatory stage of consumption that the use of hydrocyanic acid is admissible. It then may be useful in allaying irritation and cough, abating pain, reducing the frequency of the pulse, and diminishing the intensity of inflammatory action. In the advanced stage it is quite inadmissible.

Sugar of lead, either alone or with opium, has also been recommended in the early stage of consumption, as it was by Kopp. It is an old remedy revived; but, as it is suited rather to the advanced than to the early stage, I shall say what I propose on the subject under that head.

Other anodyne or sedative agents employed are, henbane, hemlock, belladonna, and stramonium, either of which may be administered to allay the irritation of coughing,—either in the form of extract or tincture. Thorn-apple is used generally in the form of smoke, but may be given also in that of extract, as prepared according to the directions of Dr Marcet. It is common to the anodyne remedies now mentioned, along with opium, that, though indicated in the early stage of the disorder, they may be given in the advanced stages.

5. Next to the means above-mentioned in the early stage, revellent remedies are of much utility. To this head belong sinapisms, blisters, the excitement of pustular inflammation by means of tartar-emetic ointment, the excitement of cutaneous inflammation by moxa, and issues by means of the caustic potass, or any of the cauteries, potential or actual. The best situation for blisters or friction by the tartar-emetic ointment are the subclavicular regions on each side, and the pectoral or mammary regions. Schroeder applies the moxa or the caustic potass issue over those parts of the subclavicular regions

where the stethoscopic signs indicate the presence of one or more cavities. But the integuments are here so thin in most phthisical persons, that these applications give rise to much suffering. The issue has been most usually applied between the shoulders by other practitioners; and, for the reasons already assigned, when speaking of the treatment of chronic bronchial inflammation, this space is perhaps the most eligible. (Vol. i. p. 849.)

6. In this stage of the distemper, also, so long as febrile and inflammatory symptoms are present, low diet, in which are no animal matters, should be enjoined. At the same time the food should not be quite so spare as in fever. Farinaceous articles, and rice, sago, and the ripe fruits, are best suited for the diet of the incipient consumptive. Strawberries, baked apples, stewed rhubarb, and similar articles, form varieties in the diet of the consumptive.

II. In the advanced or second stage of the malady, when the tubercular masses are softening or softened, and cavities are forming or are already formed, a different mode of treatment becomes requisite. It is true that incessant bronchial irritation and inflammation with profuse secretion is maintained; and it is also true, that, from the extension and coalescence of the masses and cavities, the circulation through the lung is progressively confined, and the space for the performance of the function of respiration contracted. It is further true, that when one, two, or more tubercular masses are already softened, and cavities forming or formed, in other parts of the lungs tubercles are only forming, and consequently different portions of the same lung may be in different states, as to inflammation, tubercular deposition, and softening. This circumstance, indeed, forms the great impediment in establishing a uniform method of treatment according to the relative stages of the distemper; and it always presents a considerable barrier, not only to methodical treatment, but to recovery. It is nevertheless proper to modify the treatment after the symptoms of the stage of softening have distinctly appeared.

In this stage, therefore, it is improper to draw blood from the system, or even to take considerable local bleedings by means of cupping. The application of leeches may be requisite where there are pleuritic stitches; but in general in this stage much

evacuation from the system is not desirable, and it is not well borne.

The only antiphlogistic remedies, admissible at this period, are the revellents, as blisters; the excitement of pustular inflammation by tartar-emetic ointment; the excitement of cutaneo-cellular inflammation by means of moxa, caustic potass, or the seton, (*exutoria*.)

In the second stage of the distemper, when softening is already begun, and the tubercular masses are beginning to be expelled and coughed up, there is little reason to believe that the process can be arrested. All that is then in the power of the practitioner is to allow the process to advance with as much ease and as little inconvenience to the patient as possible. This is to be done principally by the use of demulcents and anodynes, by supporting the strength with suitable food and drink, and by alleviating or opposing uneasy, painful, or distressing symptoms. The most troublesome symptoms are, in general, frequent or constant cough, with tickling in the throat, breathlessness, hectic heat and sweating, diarrhœa, and much feebleness.

For the cough and tickling, the usual remedies mentioned under the head of Catarrh and Bronchial Inflammation may be administered. Opiates also are indispensable.

For breathlessness, the combination of antimony and opium, or of solution of muriate of morphia, already mentioned, are the best means. Sometimes it is requisite to exhibit opium and ether, or the paregoric elixir, with the same view.

When these symptoms are associated with pains in the side, or in any part of the chest, if the pains be severe and enduring, the best course is to apply ten or twelve leeches to the part, as the pain often depends on pleuritic inflammation.

It is chiefly in the stage now mentioned, and where cough and expectoration are abundant, that the inhalation of vapours has been recommended.

Vapours of various balsamic or resinous substances have been long employed, and highly eulogized by practical authorities in the treatment of pulmonary consumption. Christopher Bennet, in the middle of the seventeenth century, recommended fumigations or inhalations of the vapour of frankincense, turpentine, styrax, with cinnamon, colts-foot, and other vegeta-

bles, burnt on a censer or on coals.* Similar remedies were recommended by Willis, Fuller, and Mead; but they did not come into general use.

In 1770, a case of recovery was observed to take place at Brest, under the influence of the inhalation of the vapour from a mixture of yellow wax and resin; and the success in this case led M. Billard, Surgeon-major of Marine at Brest, to try the same remedy in several cases.† The smoke or vapour of frankincense is also mentioned as a good remedy by Dr Francis Home of Edinburgh,‡ and that of resin by Dr Mudge of Liverpool.§

The inhalation of the vapour of tar, an agent altogether similar, is mentioned by Gilchrist,|| Rush,¶ and Beddoes,** the last of whom records a case of recovery from consumptive symptoms in a young lady, by walking every morning in a warehouse where a large quantity of tar was kept.

This method of medication was more systematically and forcibly brought into notice than heretofore, by Sir Alexander Crichton in 1823. It is chiefly where there is partial or complete softening and excavation that this remedy is admissible. It may be used by placing a quantity of tar in an iron pot or vessel, in the chamber of the invalid, and applying below it a spirit or gas lamp, or even a small choffer; and from the tar made to boil in this manner, the vapour is evolved and diffused through the apartment. It often at first excites coughing; but after a little it is generally followed by some greater freedom of breathing, and in the course of the following day increased facility of expectoration.

Chlorine vapour and iodine vapour, either alone or with various narcotic substances, as hemlock, opium, belladonna, and stramonium have been proposed, and may be used in the same manner. A peculiar apparatus, however, requires to be employed; and for the details, I refer to the works mentioned at the beginning of the section. Chlorine vapour is mostly indicated when the breath and expectoration are fetid.

* *Theatrum Tabidorum*, &c. Authore Chr. Bennet, 1654-56-58, p. 110, 111, &c.

† *Memoires de l'Academie de Chirurgie*, Tome v. p. 549, and 561.

‡ *Clinical Experiments*, 1780, p. 119. Vapour of *Thus*, (*Frañkincense*) in Consumption.

§ *A Radical Cure for a Catarrhus Cough*. London, 1782, p. 74.

|| *The Use of Sea Voyages in Medicine*, &c. p. 129.

¶ *Medical Inquiries*, Vol. ii. p. 118.

** *Considerations on the Medicinal Use and on the production of Factitious Airs*, &c. p. 163.

The administration of various balsamic and gum-resinous articles internally was at one time much in use in the treatment of consumption. Of this kind are the balsams of copaiba, Tolu, and Peru; the gum resins of ammoniacum, myrrh, olibanum, and styrax; various turpentine; and several of the factitious or officinal balsams. It is well ascertained that the whole of these substances are more or less stimulating, and in this manner they may act, and occasionally do act, as expectorants. But they are much too stimulating in that state of the lungs which takes place in consumption; and they have been long banished from the practice of judicious and rational physicians. Dr Fothergill undertook in 1769, to demonstrate their injurious effects, partly from considering their operation on external sores, and partly from considering the state of the lungs in consumption. It is not easy to furnish direct proof of their pernicious influence; but it may be safely asserted, that, though they are occasionally useful in cases of chronic *bronchitis*, they never can be of any advantage in the tubercular softening of consumption, and are very likely to be injurious in causing excessive irritation of the pulmonary vessels and the bronchial membrane. The chief reason that they have been so much recommended and employed rests on the influence of errors in diagnosis. By confounding cases of chronic bronchial inflammation with consumption, the remedies of the former have been recommended in the latter distemper.

It is not easy to discover the exact grounds on which another stimulating agent has been recommended in the treatment of consumption. An analogy perhaps, which has never appeared to be well established, and which, though it were, would not be here available, has suggested the use of iodine in the treatment of consumption. The analogy to which I allude, is that supposed to exist between glandular scrofula or the strumous diathesis in general, and tubercular deposition in the pulmonic tissue, and subsequent destruction. Though the existence of this analogy were proved, it would still remain to be ascertained whether strumous deposits in the lungs could be prevented, by the action of iodine, or whether that remedy prevents the formation of tubercles, or removes them when formed. One of the physiological effects of that agent is not only to excite the vascular system, and increase, as it were, capillary action, but also to induce painful constriction of the chest, with some degree of cough and limited respiration; and all these ef-

fects are very conspicuous after large doses or the continued use of iodine.

The use of this remedy, nevertheless, has been recommended more or less strongly by Dr William Gairdner, Dr Baron, Dr J. D. Morton of Philadelphia, and several other physicians, all of whom speak of it in very favourable terms. Dr Bardsley, on the contrary, found it, though capable of relieving some symptoms, yet to exercise no control over the course of the distemper. In the few trials which I have myself made, which, however, have been in the softening stage, I have observed that the patients thought themselves for some time better and recovering, exactly as consumptive patients do with regard to other remedies, which they imagine are beneficial; but, excepting rendering the expectoration less abundant, I have observed no beneficial influence on the distemper. If it be used at all, I regard it as quite inadmissible in the early or inflammatory stage of the disorder, and suited only, if it be harmless, to the advanced stage, when the tubercular masses are nearly or wholly expelled, after which, perhaps, such a remedy as iodine may promote cicatrization or the formation of *fistulæ*.

The use of anodynes and demulcents is necessary to abate the irritation of coughing.

The inhalation of various vapours is sometimes, in this stage, beneficial, not as a means of curing the distemper, but as means of allaying irritation, promoting expectoration, and relieving the uneasiness of breathlessness. To this indication the tar-vapour is well-suited. Lentin mentions with commendation the inhalation of the resinous vapours in pine forests, and Muzell speaks of the inhalation of the vapour of turpentine and pectoral herbs.

In the same stage, also, it is conceived that living in stables with cows, so as to inhale what Lord Egremont has termed the cows' ambrosial breath, is highly sanative. The remedy has been recommended by Read, Triller, Bergius, Beddoes, and several other physicians, as useful. But though cases of recovery have accidentally taken place under such circumstances, it is not a remedy upon which reliance can be placed.

Sugar of lead has been long in more or less repute as a remedy in pulmonary consumption. It was administered in the form of tincture or a solution in spirit, made by macerating in proof-spirit two ounces of sugar of lead, and two ounces of

green vitriol, according to the London College, and one ounce and a half of sugar of lead, and one ounce of green vitriol, according to the directions of the Edinburgh College. Some idea of the virtues ascribed to this tincture may be formed from the name by which it is distinguished in the Pharmacopœia of the Edinburgh College of 1744, where it is called the antiphthisical tincture. By giving from fifteen to thirty drops of this tincture, it was believed that the colliquative sweats of consumption could be restrained.

Sugar of lead was given with this intention by Paracelsus and Ettmuller, and afterwards by Reynolds, Fiesenich,* Hildenbrand,† Amelung,‡ Stark,§ Kopp,|| Horn,¶ Latham,** and several other practitioners. By some, also, it has been recommended, combined with opium, as a sedative to allay the irritation of coughing, and diminish the secretion of puriform matter; and Amelung goes so far as to think that it may heal the ulcers in the lungs. Horn, indeed, recommends it principally in pituitous consumption, that is, chronic *bronchitis*, and there probably it is useful as a sedative and astringent. In genuine tubercular consumption, I believe that it is of no use whatever; and when given it is very likely to be hurtful.

Another remedy, which, perhaps, must be referred to the same head, is the use of vinegar in considerable quantities. Acids have been long used with the view of moderating and restraining the profuseness of the sweatings; and in general to the vegetable acids, citric, tartaric, and malic, as they are found in various ripe fruits, much benefit has been ascribed in the treatment of the consumptive. But the fermented vegetable acids appear not to have been much used, except among the Moors in Barbary. From the account of Mr Orban, it appears that white wine vinegar given in rain water, and employed as common drink, with pills of benzoic acid, alum, sulphate of iron, and soot, are of much benefit in effecting recovery. The

* Dissert. sistens observationes quasdam, Jenæ, 1775.

† Hufeland's Journal, B. viii. 4 St. † Ibid. B. xxii. St. i.

§ Dissertat. de usu Sacchari Saturni in Phthisi Pulm. confirmata, Marburg. 1801.

|| Topographie der Stadt Hanau, u. s. w. 1807.

¶ Horn, Archiv. B. i. S. 310.

** Observations respecting the safety and efficacy of the internal use of Supracetate of Lead in Pulmonary Consumption. By John Latham, M. D. Med. Trans. Vol. v. p. 341. London, 1815.

pills seem to be of little moment; and the essential agent of treatment is doubtless the vinegar.*

Dr Roberts appears to have used vinegar in the treatment of the consumptive with much advantage.†

Tonics have been supposed to be indicated in this stage; and bark, gentian, calumbo, and other articles of the same properties have been exhibited with the view of increasing strength or improving the appetite. The best tonic is pure air, especially in the country, and moderately nutritious diet.

In general, in this hopeless state, all that can be done is to allay irritation as much as possible by the administration of anodynes, to support the strength by the use of food, nutritious but not stimulating, and to allow moderate quantities of wine.

In this stage, also, particular articles of food, combining, or supposed to combine, nutritious and tonic or astringent properties, are believed to be beneficial. Of this kind are vermicelli, sago, cacao, Iceland moss (*Cetraria Islandica*), and carrageen or Irish moss, among vegetable substances, and isinglass, viper broth, and shell-fish among animal substances. Iceland moss and carrageen furnish an agreeable and demulcent nutritious jelly, which is often very useful to the consumptive. Vermicelli and isinglass are chiefly indicated where diarrhoea is urgent and exhausting. Viper broth, which is an old remedy, possesses no advantage over any other animal soup, except the difficulty of procuring the materials from which it is made. Of shell-fish it is supposed that oysters are the best; and they have the advantage of being easily convertible into chyle, and nutritious without being stimulating. Of wines it is supposed that the weaker are the safest for the consumptive. Claret, hock, Moselle, or some of the light Sicilian wines, as Bucellas, are supposed to be much safer than the strong and spirituous wines of Oporto. The latter, nevertheless, may, by dilution with water, be rendered more suitable to the consumptive than in their undiluted state.

It is often requisite to administer medicines in consumptive cases for the alleviation and abatement of particular symptoms, as cough, sweating, and diarrhoea. Of the means to be used for the alleviation of the severity and frequency of coughing,

* Extracts from a paper on Phthisis, &c. Med. Trans. Vol. v. p. 277.

† Further Observations, Ibid. p. 463.

I have already spoken ; and have only to add, that the long list of emulsions, linctuses, or lohochs, which consist of mucilaginous vehicles and anodyne agents, and the lozenges, seldom do more than afford temporary relief. They do not reach the inner surface of the larynx and trachea, which is the seat of irritation ; and hence do not furnish the relief expected. They can seldom be continued long, also, in consequence of the disorder which they often cause in the stomach and bowels.

For diminishing the profuseness of the sweatings, sugar of lead or sulphuric acid has been commonly recommended. As the sweatings, however, depend on a morbid state of the lungs, which neither of these remedies can remove, they are quite ineffectual in accomplishing the object intended. A more rational method is to give small doses of ipecacuan, which has the effect often of diminishing the profuseness of these cutaneous discharges. Covering the skin with flannel is also indispensable ; and if this cannot be borne, calico or cotton, or the spun-silk sheeting used by Mr Crowther, and recommended by Dr Ferriar, ought to be employed.

For the bowel complaint the usual practice is to administer opiates and astringents. Among the former, Dover's powder, in doses of ten or fifteen grains, or one scruple, answers well ; and among the latter, the chalk mixture with the electuary of catechu or a little tincture of kino, is a useful compound. In many instances, however, the diarrhœa is preceded by, or attended with, constipation, and the accumulation of feculent matter in the intestines. In this case, the best mode of abating the violence of the diarrhœa is to exhibit small doses of castor oil, with or without solution of muriate of morphia ; and if this do not answer, to administer the starch enema, with two scruples or one drachm of the solution of muriate of morphia. At the same time it is to be remembered, that, unless due attention be paid to the regulation of the diet, the diarrhœa will continue frequent and violent, notwithstanding the medical treatment.

In general all active exercise is in this stage of the disorder impracticable ; and hence passive motion, such as that of gestation in a carriage, swinging, riding on horseback, or sailing, have been recommended. Riding on horseback was confidently prescribed as curative by Sydenham and Fuller. It is disapproved of by Stoll whenever symptoms of inflammatory action are

present; and Dr Dickson has properly remarked, that it requires to be employed with great caution, (Med. Obs. and Inquiries, iv. p. 212.) It should never be taken in cold weather, or in the face of a cold wind. Swinging is more generally admissible, because it can be employed within doors. Sailing, however, is the best in situations where the patient is sufficiently strong to be moved to the vessel, and bear all the discomforts of living at sea.

The expediency of changing climate must be determined by the state of the patient, and the stage of the disease. In general it is not safe to move in the early stage, while symptoms of inflammation may be present. At the advanced stage its expediency is always a matter of doubt, lest the fatigue, excitement, and discomforts of travelling be injurious. But when it seems admissible, it is best to choose some place accessible by sea, in order that the two advantages of the sea voyage and the change of climate may be united.

X The choice of the place is a matter of some difficulty. The climate of the Mediterranean coast seems to present no advantages, and to possess positive injurious qualities to the consumptive. The Cape of Good Hope is the least injurious, according to the medical returns of the army; and perhaps some of the Ionian Islands. In this country the south-west coast of England is believed to be well suited for a winter residence to the consumptive; and in Ireland the mild climate of the Cove of Cork is said to be still more steady in temperature.

I have endeavoured in the foregoing account to specify the method of treatment to be observed according to the different stages and symptoms of the disorder; and it is evident that, though certain general therapeutic principles must be kept in view, yet, from the nature of the disorder, and the peculiar circumstance of its presenting at the same time different pathological conditions, it is difficult, if not impossible, to lay down precise or unvarying therapeutic rules. This is one of the great causes of the insanability of consumption, and the great mortality which it occasions. There is yet another cause. In the largest proportion of cases, the physician is expected to cure not one disease, but the manifold effects of long continued morbid action. In most cases, patients apply for advice after the lungs are more or less, sometimes completely disorganized by the extensive deposition of tubercles, and even by the soften-

ing and other secondary effects of several of the tubercular masses.

It is physiologically impossible to expect that by any method of treatment, much less any class of remedies, or any single remedy, such a state of the lungs could be restored to the healthy condition; or the parts rendered capable of performing the function of respiration. It is well observed by Dr Ferriar, that "the extensive mass of disease generally apparent in inspecting the lungs of phthisical patients, and the strange formation of new morbid parts discernible in it, would require for its amelioration an effort of the Power which originally created the living body."*

The practical inference to be deduced from these facts is, that it is only in the very first or incipient stage of the distemper that recovery can be expected to take place. It is only then that the physician can rationally hope to put a stop to that action which tends to disorganize the lungs and the bronchial tubes; and if he do not then succeed in this object, he cannot expect to do so afterwards. So long, therefore, as he sees he can safely employ the means of abating inflammation, and counteracting its effects, he should continue to use these means; because the disease is then comparatively simple, and the treatment is accordingly simple. After this, the treatment becomes complicated, obscure, and uncertain in its effects, and hence it frequently becomes empirical and inefficient.

The remarks now made render it unnecessary to dwell on what has been occasionally called the tonic treatment of consumption. It is quite clear that this method of treatment is founded on erroneous notions of the nature of the disorder; and that, in a disorder so complicated, and so various, allowing that the treatment were occasionally beneficial, it must be hurtful in a large proportion of cases. This method has nevertheless found not a few supporters. Whoever wishes to examine this part of the subject, will find it treated with some ingenuity, in a small work published in 1801 by Mr Charles Pears of Kensington,† and in some observations by Dr John Hume, in the *Quarterly Journal of Foreign Medicine*, (No. 16, January 1823).

* An Essay on Digitalis, in *Medical Histories and Reflections*, Vol. ii. p. 314. London, 1810.

† Cases of Phthisis Pulmonalis successfully treated on the tonic plan, with Introductory Observations, by Charles Pears. London, 1801.

CHAPTER II.

COMPLEX DISEASES OF THE HEART.

THE heart is liable to be the seat of two kinds of disorders, one affecting its motions only, and the other, its structure in one or more of its component tissues. Several of both kinds it has been requisite already to consider. But there are other disorders, which, either as mere symptoms of a dynamic affection of the organ, or as symptoms of some organic change, or as organic changes themselves, yet merit consideration.

In admitting here the mention of various complaints, which are symptoms only, and not diseases themselves, I am aware that I am deviating from principles to which I have hitherto studied to adhere. I am compelled, nevertheless, to do so, partly on account of those for whom this work is intended, and partly because the easiest way of giving some account of these affections, is by describing them separately, while we do not lose sight of the fact, that they are in many cases mere symptoms.

§. I. Palpitation. *Palmus. Palmus Cordis*, Græcis. *Caphora*, Serapionis. *Cardiognus*, Galeni.

See Works at the beginning of sections on *Carditis*, *Pericarditis*, ; and those on Organic Diseases of the Heart in §. IV.

Palpitation consists in the heart striking the inside of the chest with unusual force, and generally more quickly in a given time than natural. Though this forcible beat is supposed to depend on the contraction of the heart, it is by no means ascertained that it proceeds from this cause. Though it were proved that the apex of the heart strikes the ribs during the contraction of the ventricles, it does not follow that this motion depends on the contraction of these muscular organs. It is highly probable that the tilting of the heart against the side of the chest is produced by the reaction of the blood impelled at the same moment into the aorta, which is thus forced to approach more nearly to a straight tube. If this opinion is well founded, it follows that palpitation consists in this motion being rendered unusually violent by some cause or causes of impedi-

ment and resistance to the motion of the blood out of the ventricle, and along the arterial tube.

Along with the forcible beat of the organ, there is sometimes irregularity or intermission of a stroke. (Gregory, 480.)

Palpitation, however, or rather irregular and violent action of the heart, may consist in something more than mere increased action. The increased force, with which the beats are made, may be attended with a rolling or tumbling motion of the organ, and with separate and distinct contraction of individual parts. In this case, the individual is often conscious of these separate vibratory jerks; and though they are not attended with pain, they are attended with the feeling of an unusual sensation, which is temporarily removed as soon as the vibratory jerk is completed. This irregular vibratory action is what has been named *Palmus* (*Vibratio a παλλω, vibro,*) by the ancient physicians, and occasionally *Cardiognmus* (*cordis dolor vel cordis motus palpitationi similis*).

In the latter form, it is not necessarily attended with increased force of impulse, but appears to be almost invariably the result of irritation applied to the heart, either dynamic or organic. It appears to bear the same relation to the regular and natural action of the heart, which spasms and tremors in the voluntary muscles bear to their regular and voluntary motion.

But whatever be the immediate cause of this violent motion, palpitation is invariably to be regarded not as a disease but as the symptom of disordered action of the heart or its appendages. This disordered action may be transitory or permanent. It is transitory when it arises from mental emotions, as alarm, surprise, fear, or even those of a more pleasant character, as joy, hope, &c.; when it takes place as an effect of indigestion, or of the nervous and irritable state which attends it; and when it occurs as a symptom of hysterics and other nervous disorders. In none of these cases is there any change in the structure of the organ; and the palpitation is a symptom of temporary derangement in the action of the heart, which subsides or disappears on the removal of the cause.

The disordered action is permanent in inflammation of the heart, (*Pericarditis*; *Endocarditis*;) acute or chronic; in rheumatic enlargement of the organ, in dilatation of the ventricles, in hypertrophy of the heart, (Willan, 336;) in arctation of the auriculo-ventricular aperture, or induration or ossification of

the mitral valve; in arctation of the aortic aperture, or induration or ossification of the semilunar valves; in ossification, dilatation, or aneurism of the aorta; not unfrequently in some diseases of the *pleura*, *pericardium*, and lungs; and lastly, in certain malformations of the heart or great vessels. *

With a view to treatment, it is the business of the practitioner to discover on which of these causes the palpitation depends. If it is the effect of mental emotion, little can be done unless by inspiring the patient with hope and confidence, and removing apprehension, by appropriate management of the mind. Where it is a symptom of indigestion, of hysterics, of inflammation, or of rheumatism, the primary disease becomes the object of treatment. Where it depends on other organic disease of the heart or its appendages, little can be done by medicine. Blood-letting gives temporary relief; and where the disease is at all manageable by medical means, these should be employed assiduously and diligently. The cure of malformation is obviously beyond the reach of art.

§. II.—Fainting; Swoon or Swooning. *Syncope*; *Deliquium*. *Defectio animi*. *Leipothymia*; *Leipopsychia*. Eblouissement. Ohnmacht.

Fainting or swooning consists in the motion of the heart and of respiration becoming extremely weak, or being suspended entirely for some time. Its phenomena are best seen in what is termed a swoon or fainting-fit, as it takes place either in consequence of some great and sudden loss of blood, or by the influence of some strong mental emotion.

Whether it makes its approach suddenly or gradually, it generally comes on with a sense of languor and of anxiety about the heart, as if the individual felt that he was ready to fall down, accompanied with giddiness, dimness of sight or prismatic colours, and ringing in the ears. The pulse at the same time becomes so weak as scarcely to be felt, or it ceases entirely; the breathing is languid or altogether suspended; the face and surface are pale and colder than natural; and the person lies insensible to all external impressions. Very commonly at the beginning, and during the continuance of the fit, the forehead, face, and neck are bedewed with a cold sweat; and every muscle of the body is relaxed, and every motion

* Medical Observations and Inquiries, Vol. vi. p. 291.

suspended. When this state has continued for a shorter or longer time, two, three, or five minutes, the pulse is felt slightly in the carotid arteries, the colour begins to return to the face, the patient fetches one or two long sighs, and he gradually returns to himself, as it is termed, very nearly with the same sensations as those which introduced the fit. The same prismatic colours, the same dimness of sight, and ringing of the ears, denote returning consciousness and sensation; and the re-establishment of the action of the heart and of breathing is attended with the same anxiety about the region of the heart. Fits of fainting frequently terminate in vomiting, sometimes in convulsions, or an epileptic fit.

There is little doubt that the phenomena now described depend, *first*, on the languid motion, or entire suspension of the action of the heart, and *secondly*, as a consequence of this, on the blood not reaching the brain, and communicating to it that property which is requisite for the exercise of sensation and consciousness, and which Cullen distinguished by the hypothetical name of the *Energy of the Brain*. (1175.)

Like palpitation, however, it is rather a symptom than an actual disease; and it may be a symptom, either of direct weakness of the heart itself, or of inaction of that organ from a defective supply of blood to excite its action; and to one or other of these states the operation of all the remote causes of fainting may be traced. Cullen, it is true, referred one of his two general orders of causes of syncope to those which exist in or act on the brain, or which operate on the heart through the intervention of the brain. Bichat, however, has shown that this is erroneous, and that fainting, as we have above stated, begins invariably at the heart, whether the remote cause is a mental emotion, or pathological agent, or an organic disease. These views are confirmed by Dr Parry.* (p. 91, 92.)

The circumstances under which fainting is most likely to take place may be enumerated in the following order.

Great and sudden loss of blood, as in copious blood-letting, wounds, or ruptures of arteries, uterine hemorrhage, or hemorrhage from the serous membranes. Mortal syncope sometimes depends on the rupture of an artery previously affected with aneurism, or other disease. Thus the arch of the aorta, the innominata, the cœliac, or some other large vessel, may give way and cause death by syncope. The peculiarity of this

* Recherches sur la Vie et la Mort, p. 185.

mode of death is, that it takes place without well-marked convulsions. (Bichat, p. 169.)

Sudden discharges of fluids to which the system has been for some time accustomed; as in evacuating the fluid of dropsy, the violent operation of certain purgatives (*hypercatharsis*.)

The exhaustion produced by long, painful, or violent efforts, as in reduction of a luxation, child-bearing, &c.

The operation of mental emotions in various persons of excitable constitution, as disgust, horror, fear, or, in a violent degree, terror or panic.

The exhaustion produced by great heat in a crowded apartment on certain persons.

The exhaustion resulting from the operation of morbid poisons, as in plague, in the commencement of which syncope is not an uncommon occurrence.

Lastly, various morbid changes taking place, or having taken place, in the heart or its appendages. Several diseases of the heart, pericardium, or large vessels, give rise to syncope more or less complete, and recurring with greater or less frequency. Thus inflammation either of the heart or pericardium, dilatation, or passive enlargement, as it is sometimes named, contraction of the orifices, induration or ossification of the valves are invariably attended with this symptom. The most frequent organic changes, however, associated with this symptom are ossification of a part or parts of the heart, ossification or other disease of the coronary arteries, ossification or induration of the mitral valve, and ossification or induration of the semilunar valves. Polypous concretions or coagulable masses, either of blood or of its fibrinous portion, have been thought by many authors, especially the older anatomists, to be one of the most ordinary causes of fainting-fits. The existence of these bodies during life has been repeatedly denied, and maintained by different pathologists. But the observations of Burns, Corvisart, and Laennec, leave little doubt on the subject; and as their occurrence must therefore be admitted, it remains only to be ascertained whether their presence be a frequent or uniform cause of fainting-fits. The examination of this point, however, will be more properly treated subsequently.

The duty of the practitioner in the treatment of fainting is very limited. In those varieties which depend on loss of blood, mental emotion, or great exhaustion, nature may be said

to be in general adequate to the removal of the swoon. When the individual falls down, the horizontal position, which the person necessarily assumes, favours the return of the action of the heart; and in most cases of fainting from hemorrhage, the horizontal position, with the head made as dependent as possible, is all that is requisite to be done. If the motion of the heart does not soon return by this management, cold water should be dashed on the forehead and temples, after which the occurrence of a long sigh generally denotes the return of consciousness, and the motion of the blood resuming its course through the lungs. Very soon after the lips become slightly red; the cheeks and countenance lose their ashen paleness; the eyelids are convulsively opened; and after one or two yawns recovery is complete.

Physicians have at various times made much use of remedies called *analeptic*, or recovering, in the treatment of fainting. Of most of these analeptics hartshorn is the basis; and a popular one is the aromatic smelling salts, consisting of ammonia and spirit of lavender. The aromatic vinegar is likewise in very general use. At other times substances containing ammonia, as feathers, quills, &c. have been burnt and held to the nostrils. It is of little moment which of these be used; but it is important to take care, that the ammoniacal preparations be not absolutely caustic, as they sometimes occasion a painful excoriation and swelling of the nostrils and upper lip, which is rather a serious remedy for an accident so trifling as a fainting-fit.

§. III. Heart-Stroke. Breast-Pang. *Angina Pectoris*, Heberden, Fothergill. *Syncope Anginosa*, Parry. *Angor Pectoris*, Frank. *Stenocardia*, Brera. *Sternalgia*. *Sternodynia*. *Angine de la Poitrine*. *Herzklemme*; *Herzbeklemmung*, Kreysig. *Brustklemme*, Lentin.

Some Account of a Disorder of the Breast. By William Heberden, M. D., &c. Trans. of Coll. of Phys. Vol. ii. Art. vi. p. 59. London, 1772.—Case of an *Angina Pectoris* with Remarks. By John Fothergill, M. D., &c. Med. Obs. and Inquiries, Vol. v. p. 233. London, 1776.—Further Account of the *Angina Pectoris*. By John Fothergill, M. D., &c. Ibid. p. 252.—History of a Case of *Angina Pectoris*, successfully treated by Dr David Macbride, Med. Obs. and Inquiries, Vol. vi. p. 9. Lond., 1784.—A Letter to Dr Heberden concerning the *Angina Pectoris*, and an Account of the Dissection of one who had been troubled with that disorder. Trans. of Coll. Phys. Vol. iii. p. 1. Lond., 1785.—A Letter from Dr Wall to Dr Heberden on the same subject. Ibid. p. 12.—A Case of *Angina Pectoris*. By Joseph Hooper, Surgeon, &c. Mem. of Med. Society, Vol. i. p. 238. London, 1787.—Case of *Angina Pectoris* from unex-

pected Disease of the Heart. By James Johnstone, M. D., Worcester. Ibid. Vol. i. p. 376.—A Case of *Angina Pectoris*, cured by the use of white vitriol. Communicated by William Lee Perkins, M. D. Ibid. Vol. iii. p. 580. Lond. 1792.—A Treatise on the Disease commonly called *Angina Pectoris*. By William Butter, M. D. London, 1791 and 1806.—An Inquiry into the Symptoms and Causes of the Syncope Anginosa, commonly called *Angina Pectoris*, illustrated by Dissections. By Caleb Hillier Parry, M. D., &c. Bath, 1799.—J. Alr. Sluys, Dissertatio de Sternodynia Syncopali. Groningæ, 1802.—Observations on some of the most frequent and important Diseases of the Heart, &c. By Allan Burns, p. 136. Edinburgh, 1809.—Observations on certain symptoms, usually but not always denoting *Angina Pectoris*. By J. Latham, M. D., &c. Trans. of Coll. of Phys., Vol. iv. p. 278. London, 1813.—De *Angina Pectoris* ejusque præcipue specie Stenocardia. Auctore Josepho Averardi, M. D., &c. Pars i. Theoria Morbi. ii. De Auxillis tentandis.—Giornale di Medicina Practica de Signore Caval. Val. Luigi Brera, Fascicol. xxv. Gennaro et Febuario, 1816.—Observations on the Nature and Cure of Dropsies, &c. Appendix, containing several cases of *Angina Pectoris*, with Dissections. By John Blackall, M. D., &c. London, 1813, and 3d edit. 1818.—Clinical and Pathological Reports. By Samuel Black, M. D., &c. Newry, 1819.

Heart-stroke, or the disease termed by physicians *Angina Pectoris*, is known by a peculiarly agonizing sense of constriction and pain, commencing under the breast-bone or deep in the chest, and shooting across the left breast and down the arm, to near the insertion of the deltoid muscle. It assumes the form of a fit or paroxysm, and comes on in the following manner.

In general, after walking up an ascent, or against the wind, or with a quick pace for some little time, or after a fit of anger or vexation, the individual feels all at once a painful constriction in the breast, which obliges him to stop immediately, and seems to threaten instant extinction of the motions of respiration and circulation. Upon standing still this sensation goes off, leaving a sense of numbness and soreness behind; but the moment walking is resumed it returns as violently as before. In other instances it comes on during the night, and does not so readily disappear. When it follows mental uneasiness, it is also more permanent. The pulse is generally very weak and small, slower than natural, and sometimes intermitting, but is rarely or never entirely suspended. The heart is represented by Burns to cease to beat during the violence of the fit, (p. 141); but this must be a mistake, as it is not clear that any case has yet been observed in which the internal pulsations were completely suspended. The breathing is neither laborious nor difficult, (Parry, 44, 57, 62,) yet it is affected in a peculiar manner, so that the patient, though

he retains the power of inspiring and expiring air, feels, nevertheless, that his breathing is not natural; it is constricted as it were, and often he cannot speak.

When the first fit of *angina pectoris* has taken place, it is generally followed at no long interval by a second, a third, and many more. Whenever the patient attempts to ascend a long stair, or steep acclivity, or to walk in the face of the wind, makes a great effort in speaking or coughing, eats a hearty meal, or happens to have his temper ruffled or chagrined, or is otherwise affected by a strong emotion, the usual sensations recur in a more violent form, and continue longer than in any preceding paroxysm. The frequent recurrence of these fits impairs the strength, and makes serious inroads on the powers of the constitution. The patient becomes weak, spiritless, and unable to make any effort, either mental or corporeal. In this exhausted state, when the fits have become frequent and severe, either some one more violent than before puts a period to his existence, or symptoms of water in the chest supervene, and induce death in the usual manner.

The heart-stroke rarely appears in persons under the fiftieth year. Dr Fothergill appears to have seen it in a person about thirty; Parry informs us, he saw it in a well-marked form in a person scarcely above forty; and Dr Black relates a case in a person of thirty-two. One case I witnessed in a young man of twenty-eight. These, however, must be regarded as not common; and the most usual period of life at which the disease is found to occur is somewhere about fifty, or between that age and sixty. Hitherto it has been observed to attack men chiefly, and among them the corpulent more frequently than the lean.

PATHOLOGY.—On the characteristic nature and the pathological causes of this affection, much doubt and uncertainty prevail. Whatever opinion Heberden and Fothergill formed of its nature, the name which they gave it, does not convey a clear or accurate idea. Nor is the opinion of Dr Parry, that it is a species of *syncope*, entitled to more consideration. The heart-stroke differs from the swoon in three remarkable circumstances;—in the mental faculties, sensation, and consciousness being unaffected; in the action of the heart not being suspended, but only disordered; and in respiration and muscular action in general being unimpaired. The patient is able to take a full inspiration, and is rather relieved by it. In fainting he is insensible, and loses all power of voluntary motion.

Little doubt, however, can be entertained that *angina pectoris* is a spasmodic disorder. The severity of the pain, the peculiar sense of constriction, the short time of its duration, and its returning in the form of fits, are the circumstances which justify this conclusion. But where is the seat, and what is the nature of this spasm, are points of extreme difficulty. The situation of the pain would lead to the notion, that the heart was the seat of the evil; but this supposition scarcely seems adequate to explain the course of the pain down the arm, and the continuance of the cardiac and arterial pulse. If the heart is affected with spasm or cramp, it is reasonable to think that its motion must be entirely suspended for the time, and the circulation ought to cease entirely as in fainting. Now the general testimony of all the observers, and even of Dr Parry himself shows, that the action of the heart in propelling the blood at least, continues the whole time of the fit. In short, if *angina pectoris* consists in cramp of the heart, it must be a cramp which does not prevent it from contracting and giving the usual shock to the arterial tubes.

Not much more is known regarding the pathological causes of this affection than of its intimate nature. In eight cases given by Drs Jenner and Parry, and Dr Black of Newry; in the case of Mr John Hunter, as given by Sir E. Home; in one case by Ring, (Med. and Phys. Journal, No. 95, 1807,) another by Dr Parr, and one case by Kreysig, it was found connected with ossification of the coronary arteries, the nutrient vessels of the heart. In two cases by Drs Heberden and Wall, and three by Dr Blackall, the aorta was found more or less ossified at its origin. In one or two cases the substance of the heart was pale and flaccid; in one or two the organ was unusually large, and in one or two it is said to be smaller than natural. From these facts it has been inferred that *angina pectoris* arises from some defect in the nutrition of the heart, (Parry, Burns,) in consequence of which it becomes unequal to its natural duties of contraction and effective expulsion of the blood, which is then retarded and accumulated in the cavities of the organ and in the large vessels, (Parry,) thus inducing the peculiar symptoms.

A more rational view of the symptoms of the heart-stroke has been given by Mr Hodgson, in his Treatise on the Diseases of Arteries. According to this pathologist, the symptoms of angina do not depend in every case on wasting of the heart from

ossified coronary arteries. Fits of acute pain in the region of the organ, shooting across the chest and extending down the arms, with numbness, palpitation, irregular beat, and syncope, accompanying all the organic diseases of the heart. He, therefore, regards the terms *angina pectoris* and *syncope anginosa* as designating rather a train of symptoms common to all the diseases of the organ, than confined to any peculiar condition.*

This opinion has been partly adopted and partly modified by Laennec. The symptoms of *angina pectoris*, according to him, are among those which are common to all diseases of the heart. But he regards it as a nervous affection, which may exist independent either of ossification of the coronary arteries or any other organic change.† Conversely, the coronary arteries have been found ossified in persons who did not labour under symptoms of *angina pectoris*.‡

THERAPEUTICS.—The treatment of this complaint has hitherto been very inefficient; and the effect of this is, that it has been both empirical and undetermined.

The object of the physician is to diminish the force of the fits, and to protract or prevent their recurrence. For this purpose, the most powerful and practicable means are, to obviate plethora, to diminish that morbid excitability which favours the formation and growth of the disease by medical and dietetic measures. Blood-letting from the system is undoubtedly beneficial as an instant and effectual mode of diminishing the plethoric state of the system. But as it is only temporary in its operation, it is better to effect the same object by diet, regimen, and suitable exercise. The patient will in this matter have more in his power than the physician. If he has been accustomed to full living, he must adopt a system of gradual but steady retrenchment. If he cannot abandon animal food entirely, he should use it sparingly, and perhaps not oftener than every second day. His food should consist as much as possible of the farinaceous articles, boiled or baked with milk, and without butter or cheese. The flatulent vegetables, however, should be avoided; and fruit is not always harmless. Wine, spirituous liquors, and even porter and ale should be entirely abandoned. Whey, small beer, or ginger-beer, form the

* A Treatise on the Diseases of Arteries and Veins, by Joseph Hodgson. London, 1815. P. 36 and 37.

† Traité de l'Auscultation Mediate, Vol. ii.

‡ See also a Case by Dr Heberden in the 5th Volume of Med. Trans., in which, though the valves and coronary arteries were ossified, no angina took place, p. 170.

safest drinks. If wine is used at all, it should be diluted with three times its quantity of water.

The action of the bowels ought to be regulated with the utmost care. If this be not effected by the change of diet and the selection of articles of food, the aloetic or colocynth pill should be employed.

The most powerful means next to diet of obviating fulness is exercise. But of this remedy patients liable to *angina pectoris* cannot avail themselves to its full extent. They will find, however, that a spare diet will enable them to walk on level ground with much less chance of a fit than their usual full mode of living. The patient should be directed, therefore, to walk about gently, to as great extent as his strength permits, every day, never immediately after a meal, on level ground if possible; to avoid all ascending of eminences or stairs; and to regulate his course in such manner that he may not have to walk directly in the face of the wind, if high or boisterous. By observing these precautions, he will be enabled to take without difficulty as much exercise as at least will insure, with temperance, that steady balance of the assimilative and the excrement functions, which prevents the vessels from being excessively distended.

Another method of no trifling power in obviating plethora is the use of an issue or seton. Though theory would say that the nearer the seat of the disease it was placed, it must have greater influence, yet it appears to be a matter of indifference where it is established. An issue or seton in the leg or arm has been found to be equally beneficial with one or other integuments of the chest. Perhaps the inside or any fleshy part of the arm is as good a situation as can be selected. (Macbride, Carmichael Smyth, Blackall, 410, 411.)

The measures now mentioned will in general have the effect not only of diminishing the plethoric state of the system, but of removing that morbid sensibility which facilitates the recurrence of the fits. But one remedy peculiarly fitted for producing this effect is sponging the chest with cold water. The effect of the cold bath is ambiguous; that of the shower bath might be injurious, from the violence of the shock given to the system. But in most cases the chest may be sponged with cold water, not only with safety, but with advantage. The patient should commence first with water slightly tepid, and from this he may proceed by degrees till he can bear it cold.

At first this may be done three times in the week, but afterwards it should be repeated daily. An important point is to rub the surface perfectly dry after each ablution.

Some physicians have recommended the use of chalybeate tonics and antispasmodic medicines. None of these, however, are efficacious; and there is reason to fear that their employment is not free from danger.

Laennec proposes to apply magnetism to the chest by means of plates of steel highly magnetised. We cannot perceive what effect an agent like magnetism can have on the animal body; and it can argue no unreasonable incredulity to refuse to ascribe any sanative power to such a remedy.

During the fit it is rarely expedient to attempt any means of shortening or mitigating it, further than can be done by putting an end to the action of the exciting cause. It is scarcely requisite to say that immediate rest, and the horizontal posture are indispensable. Opiates and antispasmodics, as ether, valerian, ammonia, musk, brandy, &c. have been tried sometimes with success, more frequently without; and according to Parry and Burns the excitement of brandy is absolutely injurious. The peculiar difficulty in ascertaining the power of any of these means consists in this, that the fit in the early stage of the disease always tends to terminate spontaneously when the exciting cause ceases to operate. It is therefore difficult to distinguish the effect of the antispasmodic from the natural tendency of the fit. In general when they have been beneficial it has been by expelling wind from the stomach; and perhaps the safest antispasmodic during the fit is a little peppermint or cinnamon water, or any other simple carminative. Blood-letting has been tried, according to Parry and Burns, with good effect; but it is not easy to reconcile the benefit thus resulting with the small quantity of blood drawn. Vomiting is recommended by Dr Percival; but its operation is ambiguous, and not well ascertained. Immersion of the hands and arms in very warm water is strongly recommended by Blackall. It does not always, however, produce relief. Rubefacients, sinapisms, and even blisters have also been tried; and, like other remedies, have been found to fail fully as often as to succeed. In short, it may be said that we possess no means medical, chirurgical, or dietetic, from the use of which during the paroxysm, relief may be certainly and confidently anticipated.

Not less important than medical is the moral management of the

patient; that regulation of the appetites, affections, and passions, (*regimen mentis*), which preserves the mind tranquil, the temper unruffled, and the spirits equally free from extreme exaltation, depression, or disorder. Whoever is subject to fits of the heart-stroke should studiously shun all occasions of having his feelings roused, or his passions warmly interested. If he is prone to anger he must either endeavour to restrain his passion, or he must withdraw himself from scenes likely to awaken it. If he feels keenly contradiction, disappointment, or insult, he had better avoid all disputes or controversies in which he may meet either with the one or the other. Lastly, he must lead a sober, quiet, and temperate life, in which neither the emotions of the soul are to disturb the functions of the body, nor corporeal affections are allowed to proceed so far as to disturb the serenity of the mind.

§. IV. A. *Endocarditis et Endocardostia. Valvularum Induratio et In os conversio. Arctatio Valvularum.* B. Dilatation of the Heart. C. Hypertrophy.

Cases of Palpitation of the Heart attended with peculiar Symptoms. By J. C. Lettsom, M. D., &c. *Memoirs of Medical Society*, Vol. i. p. 77. London, 1787.—*Medical Histories and Reflections*, Vol. i. By John Ferriar, M. D., &c. Manchester, 1792.—*Dilatation of the Heart*, Vol. ii. p. 189. 1798; and New edit., p. 249. London, 1810.—See also the Account of the effect of Remedies in Dropsy, *Ibid.*—Cases, of Organic Diseases of the Heart, with Dissections and some Remarks, intended to point out the distinctive symptoms of these Diseases. By John C. Warren, M. D. Boston, 1809. 8vo. Pp. 61.—Remarks on Palpitations and on Epilepsy. By Thomas Young, M. D., &c. *Med. Trans.*, Vol. v. p. 257. London, 1815.—Some Cases of Disease of the Heart, &c. By J. H. James, Esq. Surgeon to the Exeter Hospital. *Medico-Chirurgical Transact.*, Vol. viii. p. 434. London, 1817.—Contributions to the Pathology of the Heart. By John Abercrombie, M. D. *Edinburgh Medico-Chirurgical Transact.*, Vol. i. p. 1. Edinburgh, 1824.—Cases of Disease of the Heart, &c. By Mr Robert Adams. *Dublin Hospital Reports*, Vol. iv. Dublin, 1827.

See also works referred to under the head of *Carditis* and *Pericarditis*, especially treatises by Kreysig, Schina, Testa, Bertin, Hope, Bouillaud, and Pijaux.

The heart is liable to manifold lesions, which it would require a considerable space to describe with the requisite detail and accuracy. The most important which deserve consideration here are induration or ossification of the valves; dilatation of the heart; and hypertrophy, partial or general.

A. The lining membrane of the heart (*Endocardium*) is liable to inflammation, sometimes idiopathically, sometimes in consequence of rheumatism. The effect of this is to render the folds, especially which form the mitral valve, and sometimes those of the semilunar valves, thick, irregularly tuberculated with

small hard eminences, inflexible, shrivelled, and contracted. At first albumen appears to be deposited in the interstices of the membranous folds; then the folds are shrivelled and thickened and indurated; the tendinous chords at the same time are shrivelled, thickened, and indurated; and, gradually, the three valvular folds, by the inflammatory action continuing both at their apices and their base, produce disorganization of the former, and a considerable degree of contraction in the latter.

As this process advances it progressively renders the valve more stiff, hard, and unyielding, until it is converted into a sort of irregular ring of cartilage or bone, or cartilaginous matter, with patches of bone intermixed. The valve is then said to be ossified. The auriculo-ventricular aperture at the same time is so much contracted, that the blood no longer flows from the auricle into the ventricle with its wonted facility; and a small quantity only passes into the ventricle, while the auricle is kept in a constant state of distension, and is dilated, and sometimes its walls are thickened. In this state the auricle is said to be affected with hypertrophy.

In some instances the valve is occupied at its apices with warty tumours or growths, which have the same effect in rendering it stiff and immovable.

The tendinous chords have been known to give way during great efforts, or long-continued running; and the rupture lays the foundation of disease of the tendinous chords and the valve.

The change now described may take place at any period of life; and it has been observed in persons aged 18, 22, and at all ages under 30. But it is more frequent beyond 40 than previous to that age.

It seems very often to be the effect of inflammation of the lining membrane of the heart, affecting chiefly the valve, taking place along with or after rheumatism; and even when it appears to take place slowly in the course of a long series of years, it is the effect of chronic inflammation of the membrane forming the valves.

The semilunar valves, at the origin of the aorta, are liable to be affected with the same stiffness and induration, and to be penetrated by steatomatous matter, cartilaginous matter, or portions of calcareous matter. In the beginning, and the slightest form of this kind of change, the semilunar valves lose their pliancy, and can no longer be made to fold completely into the axis of the artery. This is easily known in the dead body, by

pouring a stream of water into the aorta, which, falling on the valves in their healthy state, detaches them from the sides of the artery, and makes them meet in the centre, so that the column of water is sustained by them. When they become rigid, cartilaginous, shrivelled, and lose their pliancy, they cannot be detached in this manner from the sides of the vessel, but remain more or less fixed, so that the water passes from the artery into the ventricle. The valves are thus inadequate to perform their function of preventing the blood from flowing backwards into the ventricle, when propelled from that chamber. In more advanced stages of this disorder, the valves are more rigid, more firm, and more penetrated by calcareous matter; their margins become rough, irregular, and tuberculated or warty; their substance thickened and firm, but very much shrivelled, so that they no longer retain either their membranous character or their semilunar figure; they gradually are transformed into a ring of firm cartilaginous or calcareous matter; and, at the same time, the orifice of the aorta is considerably contracted. In some instances, they remain in the horizontal position, as to the axis of the artery, projecting from its walls in the form of hard firm growths, and impeding much the issue of blood from the left ventricle.

Cartilaginous or osseous degenerations of the semilunar aortic valves are not uncommon lesions. They may take place at any period of life after the fortieth year; but are found earlier; and are most common in advanced life.

With or without the changes now mentioned in the aortic semilunar valves may be observed steatomatous and calcareous deposits at the commencement of the aorta, and extending into the coronary arteries. In the aorta, these deposits may be in the shape of flat patches, or warty prominences and elevations, and sometimes the inner membrane is detached, and it is observed that the blood has been flowing over a hollow sac with a rough continuous surface, like a small and imperfect aneurism. In some instances, these patches are of the nature of bony spiculæ, and a considerable space of the aorta is converted into a rigid calcareous tube.

The coronary arteries are occasionally affected with the same deposit; and then become rigid, firm, and unyielding, deranging the circulation through the heart, causing atrophy of the organ, and rendering it feeble and unable to contract with due force on the blood. Such a change has been supposed to

give rise to the symptoms of *angina pectoris* ; but it has been observed to take place without inducing any symptoms, and causing either sudden death by syncope or paralysis of the heart.

Cartilaginous or calcareous transformation of the tricuspid and semilunar pulmonary valves is much more rare ; a fact noticed by Bichat, and repeated since his time by most pathological writers, as distinctive of the difference between the external membrane of the arterial system and that of the venous. The lesion, however, is not unknown. Instances of its occurrence are given by Vieussens, Hunald, Morgagni, Bertin, the elder Horn, Cruwel, Corvisart, Burns, and Mr Bransby Cooper. In a slight degree, that is, in the state of cartilaginous induration, it is occasionally observed in the tricuspid valve, and less frequently in the semilunar pulmonary valves. It is a remarkable circumstance, that the cartilaginous or ossified state of the valves of the right chambers of the heart is found chiefly in the persons of those who present a preternatural communication between the right and left chambers of the organ ; and from this, Laennec infers that the action of the arterial blood has considerable influence in the production of these calcareous deposits.

Small granular bodies loosely adhering to each other are liable to grow on the valves, especially in the left chambers of the heart, and sometimes from the walls of the heart itself. These loose granular bodies, which have been usually denominated warty growths, (*verrucae*), and vegetations, have been ascribed by Kreysig, Bertin, and Bouillaud to the influence and effects of inflammation. The justice of this opinion Laennec questions, though he admits that a false membrane, produced by inflammation, might form in some rare cases the nucleus or rudiment, as it were, of the concretion. Laennec further ascribes these productions to partial coagulation of the blood. It seems to me doubtful, nevertheless, whether Laennec has not in this view adopted too limited notions on the nature of inflammation. Though these substances are so loose and soft that it is difficult, if not impossible, to preserve them, yet it appears to me that they may be the result of chronic inflammation of the lining membrane of the heart ; and it is some argument in favour of this idea, that these productions are often associated with other changes, which are known to be the result of inflammatory action ; for instance, cartilaginous and steatomatous transformation and calcareous deposition. By

Scarpa and Corvisart they are ascribed to the influence of the syphilitic poison. It is a well ascertained fact, that they are frequent in the bodies of those who have been subjected to the full and repeated influence of mercury.

The lesions now described may exist for some time alone. But the most usual course is, that they either give rise to, or are complicated with certain changes in the dimensions and capacity of the chambers of the heart, and various changes in the muscular walls of the organ.

Thus when the mitral valve is rendered firm or calcareous, and the auriculo-ventricular aperture is contracted, the left auricle becomes dilated and sometimes hypertrophied, that is, its walls become thick and firm.

The most common changes of this kind are dilatation of the ventricles, dilatation of the right chambers, and hypertrophy of the ventricles.

B. Dilatation of the ventricles, (*Ampliatio*,) *passive aneurism* of Corvisart, consists in enlargement of the chambers of the heart, with thinning of their walls. The muscular substance is at the same time unusually soft and flaccid, sometimes of a violet colour, in other instances pale and almost yellowish. In such instances the substance of the heart must be regarded as in a state of atrophy, hypotrophy, or imperfect nutrition. The substance is at the same time lacerable. The extenuation may be so extreme that the thickest part of the ventricle does not exceed two lines, and the apex is scarcely half a line; or the muscular substance may be so stretched, attenuated, and absorbed, that nothing but a little fat covered by pericardium retains the blood. Laceration, in such circumstances, as Burns imagined, seems not impossible; yet neither Corvisart nor Laennec met with any instance of this accident in consequence of dilatation of the left ventricle; and in none of the recorded instances of rupture does the accident appear to have been the result of extenuation, so much as friability or ulceration.

This disease M. Bertin ascribes to the operation of obstacles or impediments to the circulation; for instance, ossification of the valves, and arctation of their apertures, congenital straitness of the pulmonary artery or the aorta, professions requiring painful efforts, and certain diseases of the lungs, as hepatisation or tubercular infiltration. Though the influence of these causes is considerable, the most general and the most powerful is original conformation; that is, an unusually nar-

row pulmonary artery as to the right ventricle, and a narrow aortic orifice as to the left ventricle. Several instances of passive dilatation of the left ventricle, I have seen associated with ossification of the aortic semilunar valves, and consequent arctation of the orifice. When the right ventricle is dilated, the lesion is usually connected with more or less disease of the lungs; and the right auricle becomes at length affected in the same manner.

C. Hypertrophy or excessive nutrition of the heart may be said to consist in increased thickness of the muscular substance of the organ, which is at the same time, in general, firmer and more dense than natural. It may exist in one ventricle only, or extend to both; and it may be general or partial. When the left ventricle is affected, it may exceed an inch, or be even eighteen lines in thickness at the base, which is fully double or three times thicker than in the natural state. When the ventricle is generally affected, it is thickest at the base, and diminishes gradually to the apex; but the apex sometimes participates to the extent of from two to four lines. If the apex is affected, the disease is generally local. In other instances, partial thickening appears most commonly in the neighbourhood of the valves. In the case of the right ventricle, the increased thickness is more uniform, extending over the whole, and rendering it so firm as not to collapse when cut open. The preternatural change, however, is always most distinct in the neighbourhood of the tricuspid valve, and in that part of the ventricle which gives origin to the pulmonary artery. The bulk of the fleshy pillars (*columnae carneae*), is always much increased; and this condition, which is more conspicuous than in the left, with the great firmness of the muscular substance, forms a striking feature in the anatomical characters of hypertrophy of the right ventricle.

Hypertrophy has been distinguished by M. Bertin into three forms, according to the effect it exerts on the capacity of the chambers of the heart, or according to the mode in which the increased deposit of material is applied;—1st, simple hypertrophy; 2d, excentric hypertrophy; and 3d, concentric hypertrophy.

In the first form, the walls of one or more of the chambers of the heart are thickened, while the chambers are neither enlarged nor diminished in capacity. This is *simple hypertrophy*,

in which the increase of matter may be regarded as applied from the inner surface outwards.

In the second form, the walls of the chambers are thickened, while the capacity of these cavities is enlarged. This is *excentric hypertrophy*, in which, with the increase of matter from within outwards, there is exerted in the same direction a dilating or distending force. This corresponds with the *active aneurism* of Corvisart.

In the third form of the disorder, the thickening of the walls of the heart is combined with diminution in the capacity of the ventricles, as if the new matter had been added chiefly to the anterior of the ventricle, or had been deposited, at least, from the exterior to the interior surface. This is, therefore, named *concentric hypertrophy*.

No doubt has ever been entertained as to the existence of the two first forms; for instances of simple hypertrophy have been observed by Morgagni, Corvisart, and others, though they have not been carefully distinguished; and excentric hypertrophy is by far the most common lesion to which the heart is liable. It is different with concentric hypertrophy, the existence of which has been called in question by Cruveilhier in France, and Dr Budd in this country, both of whom ascribe the appearances deemed characteristic of that lesion to the mode and circumstances in which death takes place.

Cruveilhier had observed in the bodies of those who had suffered death by decapitation and those cut of by violent death, the two phenomena of great contraction or even obliteration of the ventricle, and proportional thickness of the walls of the heart, and he infers, therefore, that these phenomena are the effect of this species of death, and regards the concentrically hypertrophied hearts of M. Bertin and Bouillaud as hearts more or less hypertrophied in persons overtaken by death in the full energy of contraction. He further argues, that, as it is always possible to open and dilate these hearts apparently without cavity, by introducing several fingers, these circumstances indicate more forcibly that the state of the heart is the effect of the last vital contractions.*

Dr Budd, finding that in such hearts the ventricle became relaxed to its usual capacity after the heart had been macerated a few days, and that during life there was no intermittence or

* Dictionnaire de Medecine, Art. Hypertrophie.

irregularity of pulse, no dilatation of the right cavities, and no symptoms of impediment to the circulation, arrives at the same conclusion.*

It cannot be denied, that, in various instances of sudden death, as death by hemorrhage, and also in many instances of death by cholera, the left ventricle is found in this greatly contracted state, hard, firm, with thick walls, and almost no cavity, the internal surfaces of the ventricle being closely applied to each other, and the ventricle being entirely empty. It is also to be observed, that this state of the heart is found in persons, in whom none of the usual symptoms of disease of the heart were observed to take place during life, and consequently in whom the existence of such a lesion was not suspected. It may be admitted, then, that, in a certain number of cases, especially where this state of the heart is found after violent death, sudden death by hemorrhage, or sudden death from other causes, it is not positively indicative of a peculiar morbid state of the heart during life.

It seems, nevertheless, a conclusion too violent to infer, that, of all cases in which this state of the heart is found, none is to be regarded as the effect of morbid thickening of the ventricle with contraction of its chambers. M. Bouillaud, accordingly, who maintains the correctness of the views of M. Bertin, records in his work on Diseases of the Heart, eight cases of concentric hypertrophy of the right ventricle, and five of concentric hypertrophy of the left ventricle.

I have met with a few cases of this state of the heart, independent of those which I observed in the bodies of persons destroyed by cholera; and in the Clinical Report for 1832-1833, are mentioned three cases, in two of which I think no doubt could be entertained of the existence of this lesion. In the one case, in which death was caused by granular disease of the kidney, the cavity of the left ventricle was almost obliterated by the close mutual application of the walls, which were very thick, firm, and hard. In the other case, in which death was caused by an attack of erysipelas, the cavity of the ventricle was equally contracted, and its walls were nearly as thick and firm as in the former; and the patient had presented during life symptoms of *angina pectoris*.†

* Medico-Chirurg. Transact. Vol. xxi. London 1838.

† Clinical Report for 1832-1833, Edinburgh Med. and Surg. Journal.

Excentric or aneurismal hypertrophy is, nevertheless, by far the most common lesion; and the extent to which the heart may be enlarged by it is very great. The circumference of the base of the heart may amount to from 12 to 16 inches; its transverse diameter, 8 or 9; and the longitudinal diameter from base to apex, from 5 to 7 inches.

The increase in weight is the most conspicuous change. The minimum weight of the adult heart is about 6 ounces 2 drachms; the average weight about 8 ounces. In the state of hypertrophy, however, the weight is increased to 12 or 13 ounces at least, and may be so great as 22 ounces. The average of seventeen cases recorded by Bouillaud amounts to 16 ounces. The thickness of the walls of the left ventricle varies from 7 to 14 lines. The thickness of those of the right ventricle varies from 3 to 5 lines.

This lesion gives rise to, or is connected with, others very important to be known. It is often associated with bloody or hemorrhagic consolidation of the lungs and hæmoptysis; and in a considerable proportion of cases it gives rise to softening or hemorrhage in the brain.

Excentric hypertrophy is often associated with cartilaginous or calcareous degeneration of the semilunar aortic valves, and sometimes with that of the mitral valve.

Excentric hypertrophy is, in a large proportion of cases, the result of rheumatism affecting the heart, and giving rise to *endocarditis*. This may in general be known by the fact, that the individual has suffered rheumatic pains in the wrists and ankles, or in the elbows and knees, previous to the appearance of the symptoms of hypertrophy. In some cases hypertrophy, adhesion of the pericardium to the heart, and valvular disease, are united in the same case. (See p. 559 and 560.)

SEMIOGRAPHY.—Of all these diseases, the general symptoms are nearly the same. Respiration habitually short and constrained; palpitations and stiflings invariably produced by the motion of ascent, by rapid walking, by mental emotions, and returning even without known cause; frightful dreams, and interruption of the sleep by sudden startings; occasionally the symptoms described under the name of *Angina Pectoris*; and, lastly, cachectic or leucophlegmatic paleness, with tendency to dropsical effusion, which eventually appears, forming *hydrothorax*, *ascites*, and *anasarca*,—are all symptoms which, to a

greater or less extent, occur in persons labouring under disease of the heart.

In an extreme degree, the symptoms are still more obvious. Incapable of bearing the horizontal position, the patient, seated rather than lying in bed, with his head inclined on his chest, or thrown back on the pillow, retains this position night and day; his face, more or less swollen, is sometimes pale; but, most generally, has a deep violet tint, diffuse, or confined to the cheeks; the lips, swelled and prominent like those of the negro, are most intensely livid, even when the face is pale; the lower extremities, the scrotum, the labia in females, the integuments of the trunk, the arms and the face even are successively affected with œdematous infiltration. Great derangement of the capillary circulation is denoted by dyspnœa, oppressed breathing, and hæmoptysis; racking pains of the stomach, amounting sometimes to vomiting; and, finally, lethargic stupor, coma, and apoplectic seizure, which too often terminate at once the disease and the life of the patient.

Signs of Valvular Disease.—A slight degree of this disease may occur without much derangement in the action of the heart, or serious disorder of the health. In more severe cases it appears to give rise to the purring thrill, or to the bellows-flap, or the saw-creak beat. Neither of these symptoms, however, are constant or pathognomonic; and it is only when the bellows-flap or the saw-creak beat in the left auricle has continued for some time, or does not abate after blood-letting, and is conjoined with the purring thrill, that contraction of the left auriculo-ventricular orifice may be affirmed to have taken place. The same signs in the beat of the left ventricle denote contraction of the aortic orifice.

When the arctation of the apertures is great, the arterial pulse becomes small, while the cardiac beat is strong and jarring; and they are separated by a perceptible interval.

Signs of Dilatation.—With the general symptoms above noticed are associated an extended pulsative range, the contractions of the ventricle performed with a clear clicking beat, or a rustling sound, which is heard at the hyposternal point in dilatation of the right ventricle, and between the cartilages of the fifth and seventh sternal ribs in that of the left ventricle.

Signs of Hypertrophy.—Besides the general symptoms already mentioned, the most characteristic are the following. The impulse of the heart is unusually strong, and is accompanied with

visible pulsation. The impulse is diffused over the whole chest on both sides, and anteriorly and posteriorly; but it is strongest at and around the region of the heart. The beat of the heart itself is felt by the finger, and heard by the stethoscope much lower down than usual, generally below the seventh sternal rib, and often diffused over a greater space than in the healthy state. In extreme cases it is heard below the sternum and in the epigastric region.

Percussion elicits a dull sound all over the cardiac region, and below that, over the cartilaginous ends of the seventh, eighth, and ninth ribs; and at the same space a distinct bellows sound is heard at each first contraction, which is prolonged, and sinks as it were into the second.

The bellows sound is extended all over the chest, and may be heard in the back.

In advanced stages of the disorder, when the heart is much enlarged, the ribs and cartilages on the left of the sternum, and the latter bone itself become extruded and prominent.

Hypertrophy of the right ventricle is distinguished chiefly by the beats being felt at the lower end of the sternum, by the dyspnoea and orthopnoea being more urgent, and by the jugular veins being observed to rise at each inspiration.

TREATMENT.—It must seem next to absurd to speak of treatment in such diseases of the heart as those now mentioned; and, indeed, when they have proceeded any length, the natural tendency is to the fatal termination. In the early stage, nevertheless, there is reason to believe that sometimes by treatment the progress of the disorder may be retarded, the sufferings of the patient may be alleviated, and the fatal termination may for some time be averted.

In the case of valvular disease, little can be done by medicine. The patient's life hangs upon a thread; and he may either be suddenly destroyed by the action of the heart suddenly ceasing, or by the slow process of suffocation, by dropical effusion, or by cerebral disease, or by hemorrhage from the lungs. Whatever be the mode in which the disease terminates, it always causes much more suffering and distress to young persons than to the aged.

The only treatment admissible in such circumstances is to diminish the labour of the heart by occasional small blood-lettings, by local blood-letting, by means of cupping or leeches applied near the region of the heart; to produce derivation by

the employment of blisters, and the insertion of issues or setons; to relieve uneasy sensations by the use of opiates and antispasmodics as sulphuric ether; and to allay irritability of the heart by the cautious employment of foxglove.

Moderate or even spare diet should be observed; all great corporeal efforts or exertion should be avoided; and all violent mental emotions should, if possible, be prevented from acting on the patient.

In the treatment of dilatation and hypertrophy, nearly the same rules must be observed. In the early stage of the disorder, frequently repeated small blood-lettings, general or local, are attended with much benefit. In some instances, local bleeding by means of leeches over the cardiac region and the epigastric space, afford much relief both to the painful sensations and the breathlessness, orthopnœa, and sense of suffocation. Revulsion and derivation also by means of issues and setons are highly beneficial. Foxglove must be given in such doses as to abate the violence of the cardiac action, and to promote the secreting power of the kidneys; and, in general, the most eligible form is that of pill, consisting of one grain of powder of the leaves, one-third of a grain of opium, and a little aromatic confection, threetimes daily. Veratria has been recommended of late years with similar intentions; but it is an uncertain and unmanageable remedy; and it may be easily represented by the wine of the seeds, or the root of meadow-saffron.

The bowels should be kept open by means of medicine and suitable food. It is of primary moment also to exhibit carbonate of soda, or ammonia, or *aqua potassæ*, as an antacid, as the presence of air in the stomach injures cardiac sufferers in a remarkable manner.

A symptomatic method of treatment intended to remove the dropsical symptoms, has been often resorted to in the treatment of hypertrophy and other diseases of the heart. Of this method the blue pill, or calomel and squill, constitutes an important part; and for other diuretics the chapter on Disease of the Kidney may be consulted.

Lastly, it is of the utmost importance to maintain the equable circulation of the skin, especially at the extremities, by the constant use of flannel clothing, and by sheltering the patient from cold, moisture, or any agent by which rheumatic or catarrhal affections are likely to be induced.

CHAPTER III.

COMPLEX DISEASES OF THE INTESTINAL CANAL.

To this head might be referred several disorders already noticed, as the different forms of indigestion. Here, however, I shall consider Colic and Cholera only.

§. I. A. Colic. *Colica*. La Colique ; La Colique Venteuse, Nerveuse, &c.

Pain in one or more parts of the belly is a symptom of a considerable number of diseases of that region. It occurs in different degrees of severity in inflammation both of the serous and mucous surface of the stomach, (*gastritis* and *gasteria*,) in those of the bowels, (*enteritis*, *enteria*), (*diarrhœa*; *dysenteria*,) in cholera, and even in various nervous complaints, as hysteria, &c. From these the pain which forms the principal and most conspicuous symptom of colic is distinguished, by being rarely fixed and pungent, but by spreading over the whole belly, especially with a sense of twisting and wringing round the navel, and by being somewhat alleviated by gentle pressure ; by the abdominal muscles being not unfrequently spasmodically gathered into masses like balls ; and by the belly being obstinately bound. The pain of the belly is at the same time attended with a peculiar weakening and sickening sensation ; with a feeling of cold in the extremities, and sometimes in the belly ; and with an instinctive desire to seek for external heat. The sickness not unfrequently terminates in vomiting ; and this may be succeeded by more or less general heat, and moisture of the skin, when the abdominal uneasiness at the same time generally goes off, and the bowels are eventually relaxed. This is the ordinary and mild form of a fit of colic.

In more severe cases the pain, after a temporary abatement, returns in a more aggravated and permanent form. Vomiting is frequent ; and every thing swallowed is rejected with greater or less celerity. The bowels continue obstinately bound, notwithstanding the continued use of medicine and clysters. The vomiting is accompanied or alternated with hiccup. The contents not only of the stomach, but of the duodenum and small intestines may be brought up ; and in some instances the matter of clysters with the feculent contents have been discharged

by the mouth. This form of the disorder, which constitutes the iliac passion (*passio iliaca*, *ileus*, *volvulus*, &c.) of authors, is generally speedily fatal. Hiccup, intermitting pulse, chills, sweats, and cold extremities, almost invariably announce the approach of death.

From the symptoms of colic, and the dissections of persons dead of this disease, Cullen inferred that it depends on spasmodic constriction of part of the intestines. This may apply to the severe and fatal cases, but cannot explain the milder forms of the disorder. The spasmodic constriction which Cullen conceives to exist ought to have ceased after death; and if it really existed during life, it ought to have given rise to much more acute, more permanent, and more immediate and urgent sensation even than those which appear in colic. Consideration of the symptoms, of their remote causes, and of their duration and consequences, on the other hand, would lead to the conclusion, that in colic part of the intestinal tube had suffered a temporary loss of contractile power, in consequence of which, while the part above still retains its peristaltic motion, the lower portion is unable to propel the contents, and therefore becomes inordinately distended. Some spasmodic action, however, is not entirely denied. On the contrary, the intestine is thrown into violent and irregular, but inefficient efforts to propel its contents; and hence the painful griping with which colic is attended. It thus results that the pain of colic, and the spasm which it denotes, is an effect of a previous morbid state of the tube.

This is applicable chiefly to the ordinary form of colic. That known under the name of ileus is a much more severe, and perhaps a different affection entirely. It may be doubted, on the one hand, whether mere colic, considered as a spasmodic affection of the bowels, is ever a fatal disease, while there is ample proof on the other, that iliac passion is almost invariably so. The spasmodic or nervous affection may indeed terminate in inflammation; and in all probability in this mode only proves fatal. But when this is the case, it ceases to be colic, and, becoming *enteritis*, must be treated accordingly. The source of this error is doubtless the ignorance of physicians, which led them to regard cases of strangulated hernia as examples of that severe form called iliac passion. Iliac passion is to be regarded in all cases as the effect of mechanical obstruction of the intestinal tube, whether that be the result of protrusion

and strangulation causing hernia, or of internal strangulation through a loop of intestine, or of a band of adhesion, or of intussusception; or of intestinal concretions; or of the presence of a large gall-stone in some part of the canal.

The remote causes of colic are chiefly those which tend to disturb, or derange the process of digestion. Various indigestible substances, as rancid fat, goose, some shell-fish, as mussels, mushrooms of various kinds, or other matters, may be followed by griping pain and colic. The most usual causes of this kind, however, are harsh and powerful vegetable acids, especially those of unripe fruits, or of sour and eager wines, imperfectly fermented cyder, perry, or ale. The operation of these substances is much augmented by the application of cold to the extremities; and in some instances this cause is of itself adequate to produce the disease.

Colic may terminate in inflammation, or diarrhœa, or in health.

Colic is distinguished from intestinal inflammation, from *peritonitis*, from dysentery, and from iliac passion.

In new-born infants, a peculiar cause for the production of colicky pains is recognized in the presence of meconium undischarged, (*colica meconialis*.) Infants at the breast also are liable to frequent attacks of colic, (*colica lactentium*,) which can in general be traced to some peculiarity in the milk of the nurse, occasioned by improper food, mental anxiety, exposure to cold, or any of those causes which induce indigestion in the nurse.

The practice in colic has not always been uniform, being sometimes accommodated to the supposed proximate cause, sometimes to the remote causes which induced the disorder. Without attempting to enumerate or distinguish the merits of all the remedies that have ever been found successful, it is sufficient to notice those which afford the most probable means of relief. These are, 1st, remedies which exercise a sedative and antispasmodic effect; 2^d, those which operate as carminatives; and 3^d, those which act in restoring and regulating the proper peristaltic motion of the intestinal canal.

1. The remedies which exercise a sedative and antispasmodic power are opium, henbane, tobacco, warmth applied externally and internally, and blood-letting.

The effect of opium in all cases of colic is ambiguous. In mild cases it alleviates pain, sometimes relaxes spasms, and, by

determining to the skin, may cure the disorder. Its direct sedative action, however, requires it to be combined with some of the warm pungent carminatives, as clove-oil, cinnamon-oil, peppermint-water, or turpentine; and its tendency to constipate renders it indispensable to accompany or follow its administration with some of the efficient purgative medicines.

Henbane, either in substance or tincture, has less tendency to constipate; but it is also less powerful in alleviating pain and controlling irregular action.

Tobacco is better than either; but its deleterious effects require it to be administered with the greatest caution. The most convenient form is that of glyster. It appears to have the effect of not only alleviating pain, and moderating inordinate action, but, by its local excitement, of rousing the bowels to a more steady and efficient mode of action.

Warmth applied to the belly and to the feet is often of the utmost benefit in cases of colic; and it should never be neglected if the pains are somewhat obstinate. When it is ineffectual in this form, it must be applied immediately to the intestinal canal, by injection of warm water in the ordinary mode. The effect of this is sometimes increased by the use of salt, as in the ordinary glyster, or senna or turpentine, as in the stimulating ones. In still more obstinate cases the patient must be put in the warm-bath.

In ordinary cases blood-letting is unnecessary. In the more severe and obstinate, however, it is beneficial by abating spasmodic action, obviating inflammation, and promoting general relaxation and moisture of the skin. It also facilitates the operation of other remedies.

2. Of the stimulants, which in this case are termed carminatives, the principal are coriander, caraway, and anise seeds, peppermint, clove, nutmeg, cinnamon, or their essential oils, ginger, and some of the peppers, as the black, the long, or the cubebs. The principal use of these substances is to rouse the muscular fibres of the bowels to efficient and steady action. They are, however, of little avail when alone; and it is requisite to combine them with opium, on the one hand, or with purgatives, on the other. It has been above said that opium is generally best combined with clove-oil, cinnamon-oil, or peppermint-water. The same may be said of the purgative remedies, which should be united either with clove-oil, cinna-

mon, anise-oil, or ginger. With this view the colocynth pill, with a little more than its ordinary quantity of clove-oil, may be usefully administered. The efficacy of anise-oil is shown in the colic of sucking infants, in which a little sugar moistened with it often removes the griping pain, with frequent and abundant discharges of wind. A strong infusion of ginger, with senna, will also be found a useful remedy in the colic of adults. Turpentine, exhibited either by the mouth, or by injection into the colon, as possessing very powerful stimulating qualities, is often of the utmost benefit in this disease.

3. Purgatives are indispensable in the treatment of colic ; but the frequent vomiting often prevents their operation, unless preceded or accompanied either by some sedative, or by these and a carminative medicine. The most convenient, and, therefore, the most effectual form, is that either of the aloetic or the colocynth pills, given in small and repeated doses. Next to this are the spirituous purging tinctures, as the compound tincture of rhubarb and aloes, or the compound tincture of senna, in doses of from half an ounce to one ounce every hour till the bowels are moved. In some cases the sulphate of magnesia in small doses sits easily on the stomach, and is eventually followed by relief. Cullen found the crystals of tartar given in the same manner most efficacious. In other instances antimonial wine, given in such small quantity, and at such intervals as not to produce vomiting, is at length followed by alleviation of pain, relaxation of the skin, and opening of the bowels. Castor-oil is good, but rarely remains on the stomach. Calomel, though much commended, cannot be used alone. If these remedies fail, glysters must be used, as above-mentioned.

B. Colic of Poitou. Colic of Devonshire. Bellain of Derbyshire. Mill-Reek of Leadhills. Dry Belly-ache of the West Indies. Hutten-katze. Colic of Madrid, Thierry and Larrey. Entripado of the Spaniards. Painter's Colic.

De Morbo Colico Damnoniorum eoque maxime Epidemico. Anno, 1728. Auctore J. Huxham, 1739.—Account of a Disease, called Mill-Reek, at Leadhills, &c. By Mr James Wilson. Essays, P. L. Vol. i. p. 459. Edin. 1754.—An Inquiry concerning the cause of the Devonshire Colic. By George Baker, M. D. Articles xii. xiii. xiv. xv. of the London Medical Transactions. Vol. i. London, 1768, and Art. xx. Vol. ii. and Art. xxvii. Vol. iii.—Of the Colica Pietonum. By R. Warren, M. D. &c. &c. Ibid. Vol. ii. p. 68.—Some Experiments, &c. By John Hunter, M. D. &c. Vol. iii. p. 227. London, 1785.—Observations on the Diseases of the Army in Jamaica. By John Hunter, M. D. Lond. 1788. Chap.

v. p. 243.—A Candid Examination of what has been advanced on the Colic of Poitou and Devonshire, &c. By James Hardy, M. D. London, 1778.—Observations de Physique et de Medecine, par M. Thierry, 2 vols. Paris, 1791. 8vo.—Ignacio Maria Ruiz Luzuriaga Dissert. Medica sobre el colico de Madrid, &c. Madrid, 1796.—Mémoires de Chirurgie Militaire, par le Baron D. J. Larrey, Tome i. Paris, 1812.—On Hepatic Ileus or Dry Belly-Ache. By Ant. Musgrave, M. D. Med. Repository, Nov. 1825, Vol. xxiv. p. 441.

I. Colic has been not unfrequently observed to prevail extensively, at the same time, among considerable numbers of the same community. Without attempting to trace the history of this disease to periods of high or doubtful antiquity, I shall notice shortly the proofs which the records of medicine furnish of its existence as an endemic disease in modern times. Baillou informs us, that a colic of this description appeared as an epidemic at Abbeyville, and other places, in the province of Picardy in 1554; that it afterwards became fixed at Poitiers; and that it was established as an epidemic in the province of Poitou, about 1572, appears from the account of Francis Citois, of that city, in 1617. Huxham in like manner describes a similar colic, endemial in Plymouth and other parts of Devonshire, in 1724–1729. A disorder of the same character has been often observed in the northern parts of the United States, and in the West Indies, where it is known by the name of *Dry Belly-ache*, and has been described by Hillary, Hunter, Moseley, and Musgrave. Lastly, the inhabitants of the city of Madrid, both natives and strangers, are known to be liable at certain seasons, to be affected with severe griping pain in the umbilical region, accompanied with obstinate constipation and more or less vomiting,—a disease which has been well described by M. Thierry in 1755, and by Baron Larrey in 1812.

These different forms of epidemic colic are supposed to depend on the same general cause. Sir George Baker, Dr Herberden, Dr Warren, Dr Hardy, Dr John Hunter, and other English physicians, have endeavoured to show that this disease always depends on the poisonous action of lead in the system; and it is well established, that this mineral, when taken into the body, produces severe and obstinate colic, which terminates in palsy of the arms and hands, or even of the legs and muscles in general. Thus, the Devonshire colic may in general be traced to lead dissolved by the malic acid, in the preparation of apples into cyder; or, as Dr Hardy thinks, to the lead dissolved by the cyder in the glazing of the vessels used for drinking it; that of Derbyshire to the constant application of

the mineral to the clothes, skin, &c. of the miners ; the mill-reck of Leadhills in Scotland to the same cause ; the colic of Poitou, in many instances, and of other places in France, and that of the Duchy of Wirtemberg, in Germany, to the practice of edulcorating sour eager wines with litharge or metallic lead.

It is not always possible, however, to trace this disease to the cause now mentioned ; and examples are said to occur both in France and in Spain, in which circumstances of a more general description seem to be concerned in its production.

That the colic of Poitou arose from the poison of lead, no direct proof was ever adduced ; and it was chiefly because the wines used in this province were sour and eager, and therefore liable to be adulterated with lead, that Sir George Baker concluded that this was the cause.

These causes, according to Thierry, and also the more recent observations of Larrey, are the elevated situation and cold dry atmosphere of the place ; the occurrence of a cold dry season, which prevents the ripening of vegetables and fruits used as food ; the use of unripe or imperfectly ripened vegetables and fruits ; the abuse of fruit ; the use of cyder, wine, or other liquors, prepared from sour fruits, which form only eager, harsh, and pernicious drinks. The principal reasons which are assigned for this opinion are the following. This epidemic or endemial colic does not prevail in places where lead mines are wrought, or lead manufactories are conducted, so much as it does in districts and counties of the characters now mentioned. It is very doubtful if the colic of Poitou ever arose from lead taken into the system. Though the wine of this province is sometimes acid, and is therefore apt to be sophisticated with lead, the epidemic cannot always be traced to this cause ; and the cold elevated situation and dry sandy soil of the province are sufficient, in the opinion of Thierry, to account for the endemial prevalence of colic. But, whatever be said of Poitou in this respect, it cannot be applied to Madrid. Though the disease is often epidemic there, the wines of La Mancha, he contends, do not cause it, as they are not liable to be sour, and the Castilians do not drink much of them at any rate. The disease is not at all times epidemic, but is confined to certain seasons only. Thus, the epidemic seen by Thierry had commenced in the autumn of 1754, and, after continuing about a

full year, ceased in October 1755. (112). If the disease arose from the lead of the water-pipes, no great city ought to be at any time exempt from its attacks. In Devonshire in England, in Brittany, and in France, the use of cyder, which is very often sour, harsh, and prepared from unripe fruit, is the most obvious and frequent cause of the disease. In the counties of Northampton, Lincoln, Rutland, and Leicester, though little or no cyder is drunk, the colic of Poitou is observed to occur.

II. The origin of the dry belly-ache of the United States and of the West Indies is not much less doubtful. That of Jamaica is ascribed confidently by Dr John Hunter to lead taken into the system with the new rum which is drank by the soldiers and lower ranks; and by the application of chemical tests to different specimens of recently distilled rum, he certainly succeeded in demonstrating the presence of a metallic salt, probably that of lead. (Transactions of the College of Physicians, Vol. iii. p. 132.) Dr Moseley, on the contrary, denies that it arises from lead, which he asserts is never to be detected in rum in any quantity; states that he has observed the disease in persons who never drank rum; and that it was quite as frequent after this notion was published, and was to be guarded against, as before. These assertions, which are not supported by any satisfactory proofs, would be entitled to little or no consideration, did they not derive some support from the observation of Dr Musgrave of Antigua.

According to this physician, who had extensive opportunities of observing the progress and phenomena of the disorder in Antigua, the disease comes on in an insensible manner, by an uneasy sense of distension behind the ensiform cartilage, loss of appetite, a sense of listlessness and languor, and disturbed rest. The countenance is anxious, and slightly haggard; the bowels slow, imperfectly emptied; and the urine is high-coloured and scanty.

If these symptoms be disregarded, the epigastric uneasiness amounts to pain,—which becomes acute, and shoots generally upwards across the chest; squeamishness comes on, and is followed by vomiting of green leek-coloured bile, with twisting pain round the navel. With the irritability of the stomach, the bowels become less active, and more obstinately bound. But after the first vomiting of greenish-coloured matter, while the bowels are thus constipated, the matters rejected by vo-

miting are colourless, and consist chiefly of the liquids drank, and the secretions of the stomach, œsophagus, and fauces.

With this symptom the pulse is usually slow, hard, and full; and the tongue is clean; but the patient complains of thirst; is very restless in whatever position he may be placed; and the countenance is expressive of anxiety and alarm. The abdomen in cases not terminating fatally is rarely swelled; it bears pressure without inconvenience; and, though the muscles may be rigid and firm, Dr Musgrave never observed the knotty lumps and spasmodic contraction to the spine mentioned by many authors. Abdominal pain is, however, in many cases, acute and excruciating, allows no rest or sleep, and keeps the patient in a state of incessant jactitation.

In this state the disease may be said to be fully developed. Constipation continues obstinate; all medicines are rejected shortly after being taken, and injections are with difficulty retained, and come away without any trace of feculent matter; hiccup comes on; the pulse becomes quick and small; the thirst is unquenchable; the tongue is parched; the belly swells, and becomes tympanitic; the breathing becomes hurried, panting, and laborious; the pain becomes less acute till it ceases to be felt; while the head and extremities are bedewed with cold perspiration; copious liquid motions, highly offensive, are squirted from the rectum with considerable force; and life is terminated within a few hours from their commencement.

In more favourable cases the vomiting ceases, the restlessness abates, and sleep comes on. The abdominal uneasiness also subsiding, enemata are observed to be tinged by feculent matter, or followed by small quantities of dark-coloured excrement, or pitch-like matters floating on the surface. At length spontaneous evacuations of dark-coloured excrement and bilious matter take place, and continue for several days. As the discharges become thinner they assume more distinctly the appearance of vitiated bile; and are mixed with thicker matters, which have been compared to the fat of the West Indian crab. Scybalous masses are never passed on the first removal of the obstruction, unless in cases in which the early stage has been altogether neglected.

The phenomena now described, Dr Musgrave regards as dependent in a lesion not of the intestine, but of the liver, producing an increased and depraved secretion of the bile; and hence

he applies to the disease the name of hepatic *ileus*. He thinks that, from various causes, as the use of rum, telluric miasmata, excessive cold when overheated, &c. the regular and healthy process of biliary secretion may be interrupted; that the fluid received by the *pori biliarii* may be increased in quantity, vitiated in quality, and inspissated; that its course through the ducts may be retarded and stopped; and that, consequently, the liver may be left in a state of dangerous infarction and distension. This gives rise to the hyposternal pain, the vomiting, the constipation, and the restlessness; in short, all the phenomena of *ileus*.

The views of Dr Musgrave are ingenious. It seems merely a matter of doubt, whether the phenomena now mentioned originate in the liver alone, and whether they depend on increased or depraved secretion only. That the secretion or the excretion of the bile is either suspended or locked up for a time seems undeniable. But it is not easy to say what is the cause.

III. That form of the disease which occurs in painters, plumbers, printers, and pottery-glaziers, and is therefore named painter's colic, is doubtless the result of lead taken into the system, either in substance or in the form of vapour. It may appear under the acute or the chronic form. In the first case, the individual is suddenly attacked with violent and constant pain about the navel, which, with the abdominal muscles, is retracted towards the spine; with obstinate costiveness, and a frequent but ineffectual desire to evacuate the contents of the bowels. In some instances mucus or mucus with blood is discharged, with much tenesmus and straining; but no feculent stool takes place. The pain of the belly is attended with such anxiety, jactitation, and restlessness, that the patient never rests in bed, but walks up and down incessantly. Sometimes, though not always, squeamishness comes on, and is followed by hiccup, retching, and vomiting of green-coloured matter. Incoherent speech, or perfect mania is not uncommon during the constipated state of the bowels. The pulse is generally under 100 in the minute; the tongue is moist and natural in appearance; the skin is rather cool, and either dry or partially wet with clammy sweat. As the disease goes on, the weakness is extreme; pains of the muscles become universal, especially in the upper extremities; and either palsy of the hands takes place, or the patient,

becoming first maniacal, and then comatose, is speedily cut off by the disease.

In the chronic form the disease begins with dull pain of the bowels, which varies from the smallest to the most severe at intervals, and the bowels are not always bound, but may discharge mucous and bloody stools with much straining and tenesmus. These pains come in accessions and continue for a few days, or a month, or return periodically every fourth month, or annually, or at more distant periods, and are followed by remissions and intervals of ease. As the disease goes on, however, the intervals become shorter, and the accessions more severe and frequent; the strength is impaired; the muscles are wasted; and the hands become at length tremulous and paralytic. The fleshy mass which forms the ball (*adductor muscle*) of the thumb is in general particularly extenuated. Afterwards, the legs are similarly affected, though more rarely to the same extent. The appetite fails; squeamishness with pain in the region of the stomach is not uncommon; and in some cases vomiting takes place. When these symptoms have continued some time, the emaciated and powerless patient loses his recollection, becomes incoherent, blind, deaf, and generally senseless; and in no long time dies in a semicomatose state. In longer and milder cases, existence is protracted in more or less general palsy, without much disorder of intellect; and the patient, in a state of extreme helplessness and weakness, is at length cut off by some other acute disease, the natural effect of his helpless situation.

The pathology of this disease may be understood from considering the effects of lead on the living body, and especially on the muscular fibre. Without adverting much to the effects of lead on the blood-vessels, to which it is well known that it is astringent and sedative, its influence on the muscles is worthy of notice. It gives them a cream-colour, renders them entirely opaque; makes their fibres very distinct, but drier and tougher than common; and invariably gives them a shrunk or diminished appearance. (J. Hunter, apud Sir George Baker, *Med. Trans.*, Vol. i.) The influence of the mineral on their vital properties has not been made the subject of direct experiment; but, from the facts now mentioned, it can hardly be doubted, that their contractile power is much impaired, and otherwise rendered irregular. It may be presumed that the

painter's colic is the result of the reaction of the muscular fibres of the intestinal canal upon the mineral poison, as soon as it is accumulated in sufficient quantity to operate on them by its deleterious effects. If the direct physiological influence of the lead be admitted to impair the contractile power of the muscular fibre, and thereby to retard or interrupt the proper peristaltic motion, the remaining contractile power still inherent in the fibres, by which they react on the saturnine influence may be conceived to be sufficient to account for the spasmodic contraction of which these fibres become the seat.

Though it is almost superfluous to say that the remote cause of this disease is the presence of lead in the system, it is not altogether unimportant to remark the several channels by which it may be introduced. Lead may be conveyed into the system either by the mouth with food, drink, or medicine, or by the skin, by friction and absorption, or in the form of vapour, by the lungs.

1. It is conveyed into the system by the first mode in various fluids, as cyder, wine, vinegar, the fluid of pickles, medicinal remedies, as the saturnine tincture and the antiphthisical tincture of the old pharmacopœias, by applying painting pencils to the lips and tongue, as in the case of painters in water-colours, (Fothergill,) and by sucking or licking painted substances, as in the case of infants sucking their toys, (Baker; Heberden,) or even nipples dressed with ointment containing lead. (Baker.)

2. It is applied in the second mode, in the case of persons working with the metal, its ores, or its salts; as miners, smelters, plumbers, glaziers, painters, and paint-grinders, or paint-mixers, pottery glaziers, type-founders, composing printers, glass-polishers; or when lead is applied externally, as in burns, sores, &c.

It was the opinion of Mr Aiken, that the saline preparations of lead externally applied never enter the system in such quantity as to affect the general system in the same manner as they do, when introduced by the mouth, or applied in the form of vapour. This opinion, however, must be admitted to be disproved, not only by the cases given in the last paper of Sir George Baker, (Transact. Vol. iii. p. 435, &c.) but also by those recorded by Dr Percival. Further, if these cases were not sufficient to prove that the mere external application of

preparations of lead to the sound skin was injurious, yet numerous instances are known in which its application to an ulcerated surface, as a burn, &c. where it is very liable to be absorbed, is attended with the usual noxious effects on the system. A case quite conclusive on this head occurred in the Infirmary here in 1826, and is given by Sir G. Ballingall in his clinical lecture.

3. It is applied in the third mode, in the case of persons engaged in roasting lead ores, melting lead, or in preparing some of its oxides, as in smelters, (Wilson,) plumbers, or manufacturers of red lead.

THERAPEUTICS.—The only treatment on which Dr Musgrave places any reliance for the speedy removal of the symptoms of dry belly-ache, consists in the administration of calomel, so as to act on the liver and bowels, and on the gums. He first administers ten or fifteen grains of calomel, and afterwards five grains with an active cathartic, repeated every third hour, interposing some purgative mixture, if it can be retained by the stomach. In recent attacks, it is sometimes possible to remove all the symptoms by the exhibition of one full dose of calomel, viz. from ten grains to one scruple, followed by one ounce or one ounce and a-half of oil of turpentine. If by this means the symptoms be not abated, and if the bowels do not begin to act, the calomel must be continued until the mouth is affected.

If this be the main object, the best plan would be to give five grains of calomel and half a grain of opium every second hour, until a scruple is taken, after which, if vomiting continue, purgative turpentine enemata should be administered.

In the treatment of the colic of lead the first object is to open the bowels; and whatever does this soonest is the most effectual remedy. Purgatives, therefore, are indispensable; but they are sometimes not entirely sufficient, and in many cases do not operate with promptitude. This has led to the use of opium, with the view of alleviating pain, checking vomiting, and removing spasm; and, in general, the utility of this drug has been confirmed by experience.

In most cases the first thing to be done is a full dose of opium, either in substance or in tincture, or in the form of the sedative liquor of Battley. This should be followed with castor-oil, infusion of senna or tincture of aloes in divided doses, until the bowels begin to be moved. In some instances

nothing answers this purpose better than the compound colocyath pill, or a pill of calomel, aloes, and opium, in the proportion of five grains of the former to one grain of each of the latter; either of which may be taken every fourth hour till the bowels are moved.

The effect of these medicines may be aided by glysters. Thus the saline, the senna, or the turpentine enema, may be advantageously employed; and if these fail, a weak infusion of tobacco should be injected into the bowels. This infusion may also be usefully applied in the way of fomentation to the belly. In this form its physiological effects are more easily watched and regulated, than when applied directly to the intestinal tube. A blister of considerable size over the belly is highly recommended by Heberden and Hunter.

When the bowels are once opened, and the urgent symptoms have been subdued, it is requisite to obviate constipation and any return of the colic pains. With this view the same purgatives which effected the relaxation, may be employed in small doses to keep the bowels loose. But it is generally expedient to use milder agents for this purpose. Cream of tartar has long enjoyed the reputation of a specific or antidote, and with this intention is very generally employed in Derbyshire. The aloetic pills, or any of the warm stimulating purgative tinctures, as the aloetic wine, tincture of rhubarb, tincture of rhubarb and aloes, or compound tincture of senna, may also be administered as efficient laxatives.

With much the same intention certain remedies have been given to restore tone and vigour to the bowels, and counteract the pernicious tendency of the lead. Fothergill speaks highly of the volatile tincture of guaiac; Dr John Hunter recommends infusion of chamomile, gentian, or any of the light tonic bitters; Heberden advises aromatics; and most authors agree in the benefit to be derived from Bath waters.

An essential part of the curative management is to avoid, particularly, the operation of the remote cause in any form. It is quite indispensable for the patient to avoid most scrupulously all exposure to the metal in any form. He must relinquish his occupation, or conduct it in such manner that neither the vapour nor the substance can be admitted to the system. He must throw aside the clothes in which he was affected with the disease.

Acupuncture has been tried but without very decided success.

The chronic form of the disease is to be treated much on the same principles as the acute. Medicines must be given to open the bowels, and every means must be used to prevent the recurrence of constipation or of colic pains. Opiates are rarely required to the same extent as in the acute variety; but it is of the utmost importance to counteract and prevent the operation of the remote cause. When symptoms of affection of the muscles begin to appear in the form of pains of the shoulder and wrists, and inability to move the hands and fingers, it is of some moment to use antimonial medicines and the warm bath. But by far the most effectual means of resisting approaching palsy is the early use of mechanical support, in the form of a splint or splints, applied principally to the extensor muscles. By a contrivance of this kind, Dr Pemberton succeeded in restoring the power of motion to the arms and wrists in various cases of palsy succeeding to the painter's colic. The splint must be worn from six or eight weeks to three months, in some instances, before decided amendment takes place. For this form of the disease acupuncture seems to be well adapted.

The diet should be light and easily digestible. Fat and oily substances are recommended as prophylactics; but they cannot be safely used during convalescence.

§. II. Cholera. Cholera Morbus. Le Troussegalant. Mordexiin, Linschoten. Mordexi, Zacutus Lusitanus. Mordexin, Mandelsloe. Mordechi, Dellon. Mordechin, De Thevenot. Mordexim.

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Cholera may be described under two forms, according as it appears in temperate and in warm or tropical countries.

A. The first is the ordinary *Cholera* or bowel-complaint of hot seasons in temperate countries. As it appears in Britain, it consists of frequent vomiting and purging, either concurring or alternating of fluid matters, which have been generally said to consist more or less entirely of undecomposed bile. They may, however, be watery or serous, blood-watery, or like flesh washings, yellowish or bilious, then brown and successively black.

Their taste is generally very acid, almost corrosive, (*Foderé.*) These discharges are attended with violent and painful gripings, a sense of scalding both in the stomach and œsophagus, and in the rectum, generally spasmodic contractions of the abdominal muscles, and more or less of the muscles of the extremities.

These symptoms vary in their degree and rapidity. In some instances they are so violent and proceed so rapidly, that the strength of the patient is greatly and suddenly impaired. The countenance becomes pale, sunk, and ghastly; the pulse becomes weak, small, and intermitting; the extremities grow cold; cold sweats and faintings come on; and an end is put to life in the course of a single day. In other cases the disease is less violent; the vomiting and purging continue for a day or two, and then cease by degrees, leaving the strength much exhausted, but capable of rallying; though such recoveries seldom happen without the aid of remedies.

This disease is seldom attended with symptoms of fever. During its course, the pulse and respiration are hurried and irregular; but the pulse is extremely small and weak, and the breathing is languid and interrupted; and it is only when the disease is on the decline that the pulse becomes full and strong, the skin dry, or thirst is complained of. As the patient recovers strength the pulse returns to its ordinary state.

It was the opinion of Cullen, that the distinctive character of this disease should be sought for in the nature of the fluid discharged by vomiting and purging; which, according to his experience, was chiefly bile; and he therefore rejected from the definition all those forms of discharge from the intestinal canal in which the matter evacuated is not bilious. Though this character applies with sufficient accuracy to the majority of cases of cholera as it occurs in this country, yet there are examples in which the matters discharged cease to be bilious or are not bilious, which, nevertheless, cannot be referred either to diarrhoea or dysentery. And in hot climates we shall find the disease appears in its most exquisite form, and goes rapidly through all its stages to the fatal termination, without being attended with any appearance of bile in the discharges. These reasons are sufficient to invalidate the truth of the opinion expressed by Cullen, and adopted by most physicians since his time, that the disease depends upon an increased secretion of bile, and its copious effusion into the alimentary canal. It is,

for the same reason, impossible to admit the notion of the bile being more acrid than in its healthy state. If the secretion of this fluid is actually increased, its increase must depend, we know, on an increased proportion of watery fluid. But this, instead of rendering the bile more acrid, would certainly diminish its acrimony very considerably, as it is thereby much diluted with watery or serous fluid.

It is unfortunate that the discharges have neither been much examined nor analysed chemically. But it is impossible to doubt that they are of the same character as in the form of the disorder denominated Asiatic; and we may, without the risk of error, admit the same appearances in the dead body, as indicating the effects of the distemper.

This disease is generally observed to occur only during a warm state of the air, and therefore in the warmest seasons of temperate climates. Sydenham considered its appearance to be chiefly confined to the month of August; but he observed it sometimes about the end of summer, when the season was unusually warm; and remarked that the violence of the disease was in proportion to the intensity of the heat. It has, however, been known to appear early in summer, and always sooner or later, according as the great heats appeared earlier or later. Some have also attempted to connect the occurrence of cholera with the use of unripe fruits and other vegetable matters, in which the summer affords an opportunity of indulging. But there is reason to believe that the operation of such substances is chiefly to be regarded as concurring or exciting causes.

There is further a peculiar circumstance in the state of the atmosphere, to which it may be well to attend in noticing the remote causes of cholera. The disease has been generally observed to occur either during hot weather, when intense heat during the day alternates with heavy dews during the night, or when, amidst very hot and dry weather, the ground and air are suddenly moistened with a heavy summer shower.

In either case it is not improbable that the sudden application of a considerable degree of cold and moisture to the human body, previously excited and relaxed by unusual heat, may exercise a powerful influence in effecting that change in the blood-vessels and secreting capillaries which is essential to the formation of the disease.

B. The second, which is the more violent and exquisite form

of the disorder, is that which has been known of late to prevail with so much severity in various parts of Asia, the Indian, Asiatic, or oriental cholera, the *VISCHUCHI* of the Hindoos, and the *Mordexin*, *Mordyxin*, of the Moslems and Portuguese, or corruptly, *mort de chien* of some of the modern French travellers. (Sonnerat.)

I. The invasion of Asiatic cholera generally takes place in the night or towards morning. The patient feels sick at stomach, he vomits its contents, and his bowels are at the same time evacuated. This evacuation is of a nature quite peculiar to the disease. The whole intestinal canal seems to be at once emptied of its fecal or solid matters; and an indescribable and overpowering sensation of exhaustion, weakness, and emptiness follows. At the same time the countenance becomes pale and shrunk, the skin is cold, and faintness often with giddiness and ringing in the ears supervenes. The powers of locomotion are soon arrested; spasmodic contractions or twitchings of the muscles are felt in the fingers and toes, and extend gradually along the limbs to the trunk of the body. These spasmodic motions are both clonic and tonic; but generally the clonic form prevails.

The pulse is from the first quick, weak, and small; and after a certain interval, but especially on the accession of spasms or severe vomiting, it sinks suddenly, so as to be speedily lost in the external and extreme parts. The skin, which from the first of the disease is cold, becomes more so, is covered with a profuse cold sweat, or with a clammy moisture; yet the patient complains of oppressive heat. In Europeans it often becomes partially livid; the lips and nails become blue; the skin of the hands and feet become wrinkled and sodden; and the whole surface shrinks and claps to the bones. In this state the skin is insensible to the operation of chemical agents and to the irritation of a blister. At the same time the eyes sink in the orbits, which are surrounded with a livid circle; the *corneæ* become flaccid and glassy, while the conjunctiva is frequently suffused with blood. The features shrink, and the countenance assumes a cadaverous aspect strikingly characteristic.

There is almost always urgent thirst, and great desire for cold fluids, though the mouth be not usually parched. The tongue is moist, whitish, and cold. Little or no urine, bile, or saliva is secreted. The voice becomes feeble, hollow, and un-

natural, the respiration oppressed and slow, and the breathing deficient in heat.

During the progress of these symptoms, the alimentary canal is variously affected. In general there is a distressing sense of pain and burning heat between the pit of the stomach and navel, but almost never griping or twisting pain. After the first discharge, by vomiting and purging, the matter evacuated is always thin and watery, and in many cases colourless, inodorous, and homogeneous. The discharges from the stomach are mixed with ingesta; those from the bowels are the proper fluids of the morbid action; and they are very various. The most common is that of pure serous fluid, so thin and colourless as not to stain the patient's linen. The next common is a fluid like *conjee* or rice water, which is said to be nothing but numerous mucous flakes floating in the watery or serous liquor. In some cases, again, the fluid is turbid, resembling muddy water; and in others it is yellowish or greenish, like recent whey. In mild cases the matters discharged resemble *soojee* in colour and consistence. In a few cases it is brownish or tinged with blood.

The quantity of fluid discharged is in some instances very great; but it is liable to variation; and in proportion to this the vomiting and purging cease a considerable time in some instances before death. The reason of this variation seems to be that, in different subjects, according to the strength or constitution, the same cause produces a very violent effect in a much shorter time.

During all this mortal struggle and commotion in the corporeal organs, the mind remains clear, and its functions undisturbed, almost to the last moment. The patient, though sunk and overpowered, listless, averse to speak, and impatient of disturbance, still retains the power of thinking and of expressing his thoughts, as long as his organs are obedient to the will.

This is the ordinary course of cholera when unresisted by art. Its natural tendency is to the extinction of life; and, unless powerful and prompt means are used, this is the general mode of termination. A favourable issue is denoted by the pulse becoming more full and distinct; by heat returning to the surface; by an inclination to natural sleep; and by abatement or cessation of the vomiting, purging, and spasmodic mo-

tions: These changes are succeeded, after an interval of various length, by the reappearance of fæcal matter in the stools, and by the restoration of the ordinary secretions of saliva, urine, and bile.

II. Cholera as it appeared in Great Britain presented similar phenomena. These may be described in the following manner.

Nothing is more variable than the manner in which malignant cholera makes its invasion. In one individual it appears in the form of diarrhœa, that is, frequent, liquid, but feculent stools, enduring for twenty-four, thirty-six, or forty-eight hours, then followed by sickness and vomiting, and the usual profuse sero-albuminous discharges from the intestinal tube, proceeding rapidly afterwards to collapse. In another class of cases, it commences at once with sickness and vomiting, followed by frequent loose stools, and then proceeding, unless arrested by art, with equal rapidity to collapse. In a third class of cases, the first appearance of the disease consists in a sudden copious gush of gruel-like or whey-like fluid from the intestines, without manifest sickness, and followed only after six, seven, or eight hours, with sickness, vomiting, and cramps.

In all the cases in which the disease commenced suddenly with vomiting and frequent loose stools, the patient complained of an oppressive sense of constriction and weight at the epigastric region, preventing the complete filling of the lungs, and causing at the same time a distressing sensation of anxiety. When the disease appeared in the form of diarrhœa only, it was very generally accompanied with a sense of weight and distension between the epigastric and umbilical regions; and the moment the patient became sick and vomited, he began to complain of the painful constriction across the lower part of the chest. These symptoms it was of the utmost importance to watch carefully; for until they were entirely and permanently removed, the peculiar morbid action of cholera could not be considered as arrested.

As the vomiting and purging continued, this symptom became more severe and distressing, and was gradually but rapidly converted into a sense of burning heat at the pit of the stomach, accompanied with unquenchable thirst, and a sense of internal anguish, which the patient could not describe otherwise than

by complaining of the sensation of oppressive weight and constriction.

In many of the cases, the vomiting was accompanied with the constant formation of wind in the stomach, producing great distension of that organ, and rendering the process of vomiting greatly more difficult. As the disease proceeded, however, this symptom did not increase, but rather abated; and though occasionally the patient complained of it, it did not appear to be always very permanent or frequent.

The matter vomited consisted in general of the fluids drank, with more or less mucus. Several attempts were made to ascertain its acid or alkaline qualities; but these were in general attended with fallacy, in consequence of the most of the fluids drank having either free nitric acid, or free tartaric acid, or, on the contrary, subcarbonate of soda in some proportion.

The matters discharged from the intestines were much more various, and may be distinguished in the following manner.

1. When the disease commenced by diarrhœa, or frequent loose stools, lasting for hours or days, these stools were always more or less bilious and feculent, but contained an unusually large proportion of watery fluid, and a gelatinous semifluid matter. After these had been discharged for some hours, or even for two days, it might be, varying according to treatment and the diet of the patient, on his exposure to, or shelter from weather, —the first symptom of deterioration was a sudden gush of frothy or yeasty fluid, something not unlike oat-meal and water stirred together, and occasionally like dirty soap-water, which had been already used for washing. This was succeeded by similar discharges at intervals, varying from half an hour to two hours and a-half, but in each case the discharge becoming thinner and more watery, until the oat-meal or soap-washing water was superseded by a small quantity of semitransparent, opaline, sero-albuminous fluid.

2. This, which may be regarded as the second variety of choleric discharge, when attentively examined, was found to consist of a serous or watery fluid, with a thicker granular matter suspended in it in the shape of albuminous *floculi*, various in size and shape, but always so much denser than the thinner liquid, as invariably, after a very short time, to fall to the bottom of the vessel. This fluid, which is the *rice-water* evacua-

tion of the East India practitioners, was void of all smell of feculent matter ; and it generally emitted a faint mawkish odour, if such a mode of expression can be permitted,—not unlike that of water in which animal matter has been macerated for some time without becoming putrid.

In both of these two forms of choleric discharge, the disease proceeded very rapidly to collapse, and very frequently to the fatal termination. In several fatal cases which have fallen under my observation, the first symptom of the disease was a copious and profuse gush from the intestines of the soap-washing frothy fluid, taking place at intervals, first of two hours, then of one, then more frequently, and at length terminating in the scanty sero-albuminous or rice-water discharge.

Many cases in which rice-water or sero-albuminous fluid was discharged in small quantity recovered, either immediately before passing into perfect collapse, or after being some hours in it ; but these were either young persons of unimpaired constitution, or adults, who had sufficient energy, dynamic and organic, to resist the pernicious tendency of the malady.

3. A third species of choleric intestinal discharge which I have witnessed, consists of watery fluid slightly darkened in colour, and containing a multitude of gelatinous grains of a dark colour, and giving the idea of half-boiled sago, or rather of the sago grains slightly softened and diffused in water. This, I have reason to believe, is one of the most favourable varieties of the intestinal choleric discharge. I have seen it exclusively in young, healthy, vigorous, adults ; and whether it be owing to these circumstances, or the fact that in such cases the disease admitted of being treated by blood-letting, I have seen no instance of a patient dying who had this variety of discharge. I have not been able to ascertain whether this sago-like discharge succeeded to the oat-meal-water or soap-washing discharge, or whether it came on instantaneously, or succeeded bilious evacuations.

4. A fourth variety of the choleric intestinal discharge is the wine-lee evacuation ;—a dark-coloured muddy fluid, very similar in appearance and colour to the lees of port-wine or claret, but exhaling in general a faint disagreeable animal odour, like the water in which meat has been washed, only more marked and impressive. This is manifestly a sero-san-

guine exhalation from the mucous membrane of the ileum and colon. Of this variety of discharge six examples occurred in the Castle-Hill Hospital; and in four of these which were inspected, the mucous membrane of the colon was of a purple-red colour and thickened, the submucous tissue was traversed by numerous vessels containing dark-coloured blood, and actually elevating the mucous membrane, and patches of dark-red extravasation were observed scattered over the submucous tissue. In one case, with these appearances were conjoined red injection of the ileal mucous membrane, considerable enlargement of the solitary glands, which were as conspicuous as millet seeds, and numerous large vessels distributed through the submucous tissue. The mucous membrane itself was uniformly covered by a tenacious adherent mucus, of a dark-brown colour, similar to soft viscid currant-jelly, and which could not be removed without repeated washing and macerating in water.

This wine-lee species of intestinal discharge is by far the most fatal form of the disease; and not one of the patients in whom it took place recovered. I may add, that it was apparently associated with a peculiarly diseased state of the ileal or colic mucous membrane; since the vessels of this bowel appeared to be enlarged and varicose, and the bowel itself was irregular and preternaturally villous on the free surface.

In collapse, the countenance was not always blue, as several descriptions would lead us to suppose, but rather of a dull leaden or dingy colour; but a few instances exemplified the deep blue tint; and I think the explanation is to be found in the difference of the natural complexion. In persons in whom the complexion is naturally florid, and rather what is termed high-coloured, when collapse comes on, the countenance becomes of a deep-blue; and when this state is completely established, it acquires with the neck, breast, and extremities, a tint not less intense than that of the bilberry.

III. Cholera in the different countries of Europe has been distinguished by a third stage, or that of reaction, (*anastasis*), which has been represented by several observers to resemble the usual characters of typhous fever. There is, however, a wide difference between the state of the system in typhous fever and during the reaction from the collapse of an attack of cholera.

Choleric reaction consists in a congestive state of all the blood vessels of the head, chest, and belly ; the vessels of the brain and its membranes ; those of the lungs and the heart ; those of the spleen, stomach, and intestines ; and those of the liver and kidneys especially. This congestion is not confined to the brain alone, or to the lungs alone, but extends to every part of the sanguiferous system. It approaches in general by slight redness of the cheeks and a little warmth of the face, while the eyes continued still sunk in the orbits, and surrounded by a leaden-coloured *areola*. At the same time the breathing, which had before been slow and languid, becomes slightly freer, but is performed by an extremely labouring and heaving motion of the chest, without, however, seeming to fill the lungs perfectly. At this period there is often hiccup, or even occasional retching or vomiting ; and the congestion of the kidneys is indicated by no urine being as yet secreted. In the course of eighteen or twenty hours, if this state did not ameliorate, a degree of drowsy lethargy and sleep came on, from which the patient could be raised, speaking not always very coherently, and often showing hallucinations and other errors of sense ; the respiration either became more frequent, with short and incomplete inspirations, or, remaining the same in point of frequency, was slow, languid, and feeble ; mucous rattling was heard in the bronchial tubes ; the pulse continued heavy and oppressed ; and the beat of the ventricles was dull and labouring ; the surface at the same time exhaled a urinous odour, and no urine was voided. At the end of twelve or twenty hours more, this state was followed either by complete lethargy and coma, or violent and uncontrollable delirium ; the respiration became slow and feeble, or rapid, and with incessant tracheo-bronchial rattling ; the surface became cold ; the action of the heart still more labouring and oppressed, and without any urine being discharged, yet bilious and feculent stools escaping either involuntarily, or by the use of medicines ; the patient, after gasping long in a half-dying state, breathed his last.

Nothing can be more anomalous than the whole of this state of reaction, which embraces, as it were, the symptoms of several different diseases at once ; and which, though possessing several common characters, was scarcely in any two patients in all respects the same. These variations occurred not mere-

ly in the degree of the affection of each organ, but in the combination of the affection of the different organs.

The symptoms of affection of the head constitute the only features of resemblance between typhous fever and the reaction of *cholera*. But these symptoms, I shall show, indicate an affection entirely different. These symptoms consist in a species of cerebro-meningeal congestion, in which it is very difficult, if not impossible, to draw the load of blood from the internal vessels, and restore the natural and healthy secretions. In children this affection bore a very close resemblance to the meningeal inflammation which constitutes *hydrocephalus*, or terminates in water of the brain. In adults it occasionally resembled the *delirium* of *delirium tremens*; but more frequently it was rather a profound lethargic stupor; and in a few cases it assumed the characters of incessant sleeplessness and unmanageable delirium, with constant speaking and muttering.

The affection of the thoracic organs was not less characteristic. An extreme sense of weight in the chest, incapacity to inspire fully, and frequent sighing or moaning to relieve the anxiety thus occasioned, were the leading features of the disorder.

In general, the respiratory murmur was impaired in intensity, and in some instances it was extinct, or at least could not be heard at the middle of the *demithorax*; while there was more or less mucous rattle in the windpipe and bronchial tubes. The action of the heart was in general very much disordered. While it generally was so forcible as to shake the whole chest, and make the patient sensible of its impulse, it was very oppressed and jarring, as if the ventricles contracted with a vibrating thrill; and the sound was invariably dull.

In most of the cases, when the cerebro-meningeal congestion was not so considerable as to extinguish organic sensibility, the patients complained much of unquenchable thirst, and a sense of gnawing burning heat at the region of the stomach, which was incessant, and often accompanied with the distension of air, which could not be expelled. This sensation, I think, manifestly depended on the congested state of the vessels of the stomach and *duodenum*, and the incapacity to propel the blood freely through their communicating capillaries. In some instances, it was accompanied with incessant hiccup; in others with hiccup and retching without vomiting; and in a few

with mere distension and pain in the hypochondriac or iliac regions.

In two cases during this stage, bile was brought up from the stomach by vomiting.

The inert state of the kidneys was always a leading, and in this state a very bad, symptom. In mild cases of the disease, the urine began to flow spontaneously as soon as the stools became bilious, and even before that phenomenon in some instances. But when the patient had been in distinct collapse for many hours, the urine rarely flowed so easily; and it was generally twenty-four or thirty-six hours after reaction commenced that this secretion began to appear in a scanty form; and then it was often coagulable on the application of heat. In other instances, however, it did not return at all; and in those in which the cerebro-meningeal symptoms, and the pneumo-bronchial and cardiac oppression continued or increased, the patient struggled in a protracted agony for several days, and died without secreting a drop of urine; while the surface exhaled a urinous odour more or less distinct. This suppression of a secretion so important and necessary to the well-being of the circulating function, might seem to depend on the affection of the brain, and thereby to resemble the suspension of secretion, distinguished by the nosological name of *ischuria renalis*. At first, this opinion appeared to be well-founded, and perhaps may be partially applicable to a variety of cases of suspended secretion. But in the course of observing the progress of the disease, and inspecting the bodies of those cut off in this state, there occurred circumstances which induced me to modify considerably, if not to change entirely, this opinion.

The suppression of the urinary secretion and the urinous exhalation from the surface of the body are to be viewed as part of that general state of congestion of the vascular system, which interrupts the whole process of circulation, and its dependent one of secretion; and appear to be closely connected with, if they do not entirely depend on, the local congestion of the renal vessels and capillary system taking place in the early stage of granular disease of the kidney, and sometimes in the established stage of that disorder.

IV. MORBID ANATOMY.—(*India*.)—The external appearance of European subjects destroyed by cholera resembles that which is observed towards the close of life. The surface is livid or dingy; the solids are shrunk; and the skin of the hands and

feet is corrugated, and similar to those of a body which has been under water.

No particular morbid appearances were found (in India) in any of the cavities lined with serous membranes, or within these membranes themselves. The cavities of the *pleura*, of the *pericardium*, and of the *peritoneum*, are in a natural state; or the deviations have no connection with cholera.

The surfaces lined with mucous membranes generally present signs of disease.

The lungs may be found in a natural state, even where the breathing has been oppressed previous to death. More generally, however, they are either gorged with dark blood, so as to resemble the appearance of liver or spleen; or they are collapsed into a small bulk, lying in the hollow on each side of the spine, leaving the cavity of the chest nearly empty. The blood found in the lungs is always very black.

The heart and its large vessels are distended with blood, which is dark-coloured even in the left cavities.

In the abdominal cavity the peritonæum is in general natural, though occasionally it is tinged bluish, and through it are seen large vessels tinged with dark-coloured blood.

The stomach and intestines present, in general, their ordinary volume. The former is seldom empty or much contracted; appearance of spastic stricture of the pylorus has been sometimes, not often recognized. The contents are chiefly the ingesta in an unaltered state; in some cases greenish or yellow or turbid matters are found. The stomach has been found in the Indian cases lined with calomel. The mucous membrane is thickened, softened, and friable; sometimes vascular and injected.

The intestinal tube is sometimes collapsed, but more frequently more or less filled with air,—distended in some parts into pouches containing whitish, turbid, dark, or green-coloured fluid; in other parts much constricted. No fecal or solid matters are found in the intestines; but very commonly large quantities of conjee-like fluid, or of turbid serous matter. The *duodenum* and occasionally the *jejunum* are more or less loaded with viscid adherent mucus, whitish or greenish; but in other cases their mucous coats are stripped of their natural mucus. Traces of bile in the intestines, or of any article which has proceeded from the stomach, are extremely rare.

The liver is in general loaded with blood. The gall-bladder is filled and sometimes distended with bile. In the state of the ducts nothing uniform is recognized.

The urinary bladder is always small, shrunk, contracted, and void of urine.

Appearances of vascular congestion are found in the brain and its membranes, and the spinal chord and its coverings.

England.—The appearances observed were of two kinds;—*1st*, morbid changes common to choleric subjects and others; and *2d*, morbid changes proper to choleric subjects. These morbid changes were further observed to vary according as the patient was cut off in the stage of collapse, or during the period of *anastasis* or reaction.

I shall, therefore, take a short view of the morbid changes proper to choleric subjects in the two periods, *1st*, of collapse and *2d*, of reaction, and then *3d*, enumerate the morbid changes found in the bodies of choleric subjects, but which have no immediate connection with that disease or its effects.

1. In patients cut off during the former stage, the following appearances were very generally observed.

The stomach was contracted, and contained some semifluid matter, the last taken during life; and its mucous membrane was very uniformly covered by a quantity of viscid tenacious mucus, which adhered very closely. The mucous membrane corresponding to the cardiac region, and to the large arch before and behind, was puckered into large prominent *rugæ* or wrinkled folds, the *apices* of which were ordinarily very much injected with dotted and arborescent vascularity, while the intermediate furrows and spaces were at least of a general rose-red colour, and occasionally injected. This could not be the effect of cadaveric exudation; for it was not removed by washing, and though it acquired a brown tint, it was not discharged by immersion in spirits.

The *rugæ* are described by most anatomists as parts of the natural structure; and unquestionably they are found in the most healthy subjects after death. But they are most distinct when the stomach is constricted by the energetic contraction of the orbicular muscular fibres; and in the majority of subjects inspected after death we never observe them. In the bodies of those cut off by *cholera*, their presence and strongly

developed form depends on the forcible contraction of these fibres during the stage of vomiting and collapse.

The gastric mucous membrane was also considerably thicker than it is observed in subjects cut off by other diseases; but this is to be ascribed also chiefly to the contraction of the muscular coat over it; and perhaps, in a more trivial degree, to the greater quantity of fluid in its capillaries. It was not, however, softened, unless in one case, in which the whole of the posterior half between the great and small arches was reduced to pulp, and was hanging in loose shreds and patches of various size. In this case also a distinct sharp line of demarcation was observed between the sound and the softened part of the gastric mucous membrane, the former being uniform in surface, and of its usual light rose-coloured gray,—the latter all at once soft, loose, prominent, and easily detached, and of a peculiar dirty ashen or wood-brown colour. The individual, in whom this irreparable lesion was observed, died in a state of profound and irrecoverable collapse, during which he took several doses of the saline powder recommended by Dr Stevens, and had two ipecacuanha emetics of thirty grains each.

The peritoneal coat of the stomach was almost invariably marked by a slight blush of faint red; and its surface, like that of the intestinal peritoneum, was generally covered with a peculiar glutinous exudation.

This redness of the serous and mucous surfaces of the stomach could almost uniformly be traced to injection or congestion of the vessels distributed in the substance of the gastric filamentous tissue, through which they could be seen very much filled with blood to their minutest ramifications.

The *pylorus* was always thick and prominent, and its aperture much closed. The mucous membrane of the *duodenum* was in general covered with the same tenacious adherent mucus observed in the stomach, only more tinged with bile; and when this was removed, it was found sometimes of its usual gray colour, at other times slightly reddened. The upper part, for two or three inches, was in general uniform in surface; the inferior always folded into numerous folds, (*plicæ*), or *valvulae conniventes*.

The intestinal canal was always unusually contracted both in the small and large intestines; and I have several times seen the transverse arch of the colon shrunk as small as a portion of

ileum. With this contracted condition was usually combined a marbled appearance of the *ileum* especially, the streaks of which were generally in the circular direction of the intestine, and depended on the *plicæ* or *valvulæ conniventes*.

The contracted condition above noticed was occasioned by the forcible constriction of the intestinal muscular fibres; and the marbled or mottled appearance was produced partly by this, but chiefly by the congestion of the vessels of the intestinal filamentous tissue. In several instances, the contraction was so considerable, and accompanied with wrinkles so firm, as to resemble the cadaveric rigidity, and must have been the result either of that or of the spasmodic contractions which constitute so striking a feature of the disease.

The peritoneum, both muscular and intestinal, was covered by a glutinous exudation, which could be drawn out in ropy threads. The intestinal peritoneum presented in general a reddish tint, or a colour between red and pale pink; but when this was closely examined, it was found to depend chiefly, if not solely, on the vessels distributed through the intestinal or subserous tissue.

The intestinal mucous membrane was always covered with a thick layer of viscid adherent mucus, generally tinged with bile at the upper part of the tube, but often colourless below. When this was removed by repeated washing and immersion in water, the intestinal mucous membrane appeared with the *valvulæ* very distinctly marked, the membrane generally slightly reddened, and occasionally thickened, but not softened. This rubescent tint, as it may be named, was very indistinct at the upper or duodenal extremity of the *ileum*. At the distance, however, of four, five, or six feet from its lower or colic extremity, it became very conspicuous, and was occasionally very distinctly marked.

Along with the rubescence, which was generally slight, the agminated glands of Peyer were in almost every case more conspicuous than natural, and so prominent as to present a distinct elevated line enclosing a patch of the usual elliptical shape, palpable by the finger, and visible to the eye.

The point at which the patches of agminated glands became distinct, varied in different individuals from three feet to six from the cœcal or inferior end of the *ileum*. In most adults they began to be visible at the distance of five feet; in some

small patches were seen so high as seven feet or eight feet ; and in the bodies of two children, they were recognized at a much higher situation.

In most of the bodies of the persons cut off by cholera, one or the other or both of these orders of glands were unusually prominent and well-marked. In the bodies of children, the agminated glands were invariably much more prominent than in adults, and were generally so rough as to induce superficial observers to regard them as ulceration. When, however, they were closely and carefully inspected, they proved to be merely the individual component follicles of the cluster, very much enlarged and swelled. In the bodies of children, the isolated glands were, on the contrary, not nearly so well marked, and were often totally imperceptible.

Conversely, in adults the solitary glands were always much elevated, and acquired in some instances the size of millet seeds, so as to be distinctly seen to render the ileal mucous surface rough and irregular. In one case in which there had been wine-lee stools with reddish granular bodies discharged *per anum* similar to gooseberry seeds, not only were the isolated ileal glands enlarged, and prominent, and reddened, but the whole ileal membrane was of a pale or light-red colour from vascular injection.

In the majority of adult subjects, however, the agminated glands were elevated, more distinctly visible, and not only more enlarged than natural, but they were redder, and, when held between the eye and the light, the patches which they formed were more opaque than the rest of the membrane.

To give some idea of the prevalence of these appearances in the bodies of those cut off by cholera, among the 26 cases inspected, 22 presented enlargement and irregularity of the agminated glands ; and 21 more or less distinct developement of the isolated glands.

While, therefore, it must be admitted that this enlarged and developed condition of the intestinal glands is the most frequent and uniform morbid appearance of the intestinal mucous membrane in cholera, it would perhaps be precipitate to infer that it is either the cause of the profuse discharges, or the effect of the choleric action, whatever that may be. These glands appear to have been in most instances in a morbid state previous

to the choleric attack ; and as this morbid state appears to consist in an unusual accumulation of blood in the vessels, indicated by the enlarged appearance, and perhaps in some increased degree of excitement, it is not improbable that it may have acted as a predisposing circumstance.

It is remarkable that the follicles of the colic mucous membrane were by no means very commonly or frequently enlarged ; and, excepting in four or five cases, though diligently looked for, they were not recognized otherwise than in very minute orbicular *areolæ* or *disci*, not elevated above the surrounding membrane, and chiefly cognizable by the minute central aperture or excretory pore. I have indeed seen these follicles more distinctly in dropsical subjects than I have done in those cut off by cholera.

The other morbid appearances proper to cholera, and observed chiefly in the stage of collapse, though occurring in a great variety of organs, were all confined to the vascular system of these organs.

The heart generally presented round its base at the junction of the auricles and ventricles, and along the acute or right margin, a train of dark-coloured ecchymotic spots, irregular in shape, and varying in size from the area of a small vetch to that of a split pea, or even larger. These spots were in the subserous tissue beneath the cardiac pericardium, and were in some instances largest and most numerous along the course of the vessels. Connected with this the surface of the aorta and pulmonary artery, but especially the former, was traversed by numerous minute communicating vessels, very much injected, and forming a complete vascular net-work, encompassing the proper tunics of the vessels.

The right auricle and ventricle invariably contained a large mass of semi-coagulated dark-coloured grumous blood, implicated more or less firmly with the *musculi pectinati* and walls of the former, and the *columnæ carneæ* and walls of the latter ; and from these a large coagulum, generally fibrinous, extended into the pulmonary artery. The left auricle contained a small quantity of semi-coagulated dark-coloured gore ; and a small quantity of the same was very generally found in the left ventricle, the walls of which were always firm and hard, and the capacity very small, as if it had been much and forcibly contracted.

The trunks of the pulmonary arteries and the corresponding veins contained much semifluid uncoagulated blood, in both of an equally dark colour,—at least so nearly of a shade that it was impossible to draw any distinction.

The injection of the vessels of the filamentous tissue outside the aorta, and of the *vasa vasorum*, was continued from the arch of that vessel upwards along the *innominata*, or right subclavio-carotid trunk, and the carotid and subclavian of the left side, as far as these vessels were traced in the neck; and over the arch, and down the thoracic and abdominal *aorta* on the trunk; and occasionally the general sheath of the former vessels, and the neurilematic covering of the pneumogastric nerve, were much injected by numerous minute vessels.

The tracheal and bronchial membranes were injected and embrowned, and the mucus contained within the bronchial tubes was tinged with blood.

The proper substance of the lungs was always loaded and almost stuffed with dark-coloured blood, so as to communicate to it a deep brown colour, and impair, if not destroy, its susceptibility of inflation. The substance of these organs was also inelastic, and much more compact than usual, giving a doughy and inelastic sensation to the finger.

The same appearances were observed in the vascular system of the head and spine and their contents. The scalp was no sooner divided than a quantity of semifluid blood, more or less copious, escaped from the incisions; and even the bone itself was bluer than usual with the blood accumulated in its substance. The different sinuses of the *dura mater*, in like manner, generally contained much fluid or semifluid dark-coloured blood, which continued to flow very freely for some time.

When death took place after some hours of duration in collapse, a considerable quantity of serous fluid was infiltrated into the subarachnoid filamentous tissue; and though in early cases this was more scanty, in none was it entirely wanting.

The vessels of the *pia mater*, which were invariably extremely numerous, were, with equal regularity, very much injected, the large ones with dark-coloured blood, the small ones with red; and it was interesting to remark the transition from the former to the latter order of the vessels. In some subjects the *pia mater* presented, even along its frontal and pa-

rietal regions, and at the base of the brain, continuous dark-red patches, as if blood had been extravasated; but this on more minute inspection was found to be blood in the capillary vessels of the arachnoid surface of the *pia mater*. The *pia mater* covering the inferior surface of the annular protuberance and spinal bulb, was also very generally much injected, so as to give that body a very vascular appearance.

The vertebral, basilar, and carotid arteries, and their branches always contained a quantity of dark-coloured blood, which was in no instance coagulated, but was in general semifluid, ropy, and consistent.

The substance of the brain was natural in consistence and colour, unless in a few instances to be specified. But when divided it presented numerous circular apertures of considerable size and transverse fissures, which freely effused blood, in general dark-coloured. The part most conspicuous for these sanguiferous apertures and fissures was, as in other cases, the *corpus striatum* and the anterior part of the *optic thalamus* in each hemisphere.

The substance of the annular protuberance was invariably more or less traversed by large vessels, and exhibited apertures and fissures effusing fluid blood. In one or two instances its gray matter was of a faint rose-red tint. The substance of the cerebellum was in like manner injected, and traversed by numerous blood-vessels, especially in its external or foliated structure. But the part almost invariably most affected in this manner was the gray crust of the *corpus rhomboideum*, in the denticulations of which many minute apertures effusing blood were observed.

The vessels of the central surface of the brain and its membranes were similarly affected. Thus the choroid plexus was always much darker than usual, by reason of the blood in its vessels; and the *velum interpositum* was of a deep-red colour, and traversed by numerous large vessels, containing dark blood. The superior surface of the *corpus striatum* in each ventricle, and each side of the *fornix*, to its posterior extremity, was traversed by several large vessels containing dark-coloured blood. A little serous fluid was occasionally found in the ventricle; but this appearance did not belong so much to the stage of collapse, as to that of sinking after long collapse or partial reaction.

The muscles of the spine were always loaded with a great quantity of dark-coloured blood, which was here more perfectly fluid than in any other part of the body. The substance of the spinous plates also, and of the bodies of the *vertebræ*, were of a dull blue colour, and effused more or less dark-coloured blood; while the rachidial veins were generally very much filled, and discharged blood freely, and the filamentous tissue of the sheath was perfectly black with blood. This blood, when collected in pools, always presented a sort of oily scum or coating on its surface, and never underwent complete separation into clot and *serum*.

In several instances, perhaps seven or eight, there was at the upper extremity of the spinal chord, in the angle between the bulb and the chord, a considerable quantity of serum infiltrated into the subarachnoid tissue, and elevating the arachnoid from the *pia mater* of the chord. A more uniform appearance was a slight general effusion between the arachnoid and *pia mater* of the whole chord, both before and behind, but perhaps most in the latter situation.

The *pia mater* of the chord was always more or less traversed behind by large well-injected vessels, which, though numerous, were not much less so before. These vessels were in general most abundant and largest in the cervical and lumbar regions; and the individual chords of the brush-like expansion, named the *cauda equina*, were always most completely covered by minute vessels.

The substance of the chord, though firm in most cases, was in one or two a little softer than natural. In other respects, it was sound; and in four only, of nineteen cases examined, did the central gray matter present any unwonted degree of vascularity.

The liver was in general natural in its proper substance; but its vessels were always much lined with dark-coloured semifluid blood, and the *pori* contained dark-green bile. The gall-bladder was invariably full of bile, generally dark-green in colour, and viscid in consistence; and the ducts were pervious.

The spleen was always natural, and the colour of its internal substance was of the usual dark-red or purple tint.

The *pancreas* was unchanged in appearance and structure.

Next to the brain and lungs, the kidneys partook most of

the general distension of the vascular system. The external cortical or granular substance was always much darker than natural, and, not only when divided, effused blood from circular apertures and linear fissures, proceeding from the outer to the inner margin, but at the latter, where it unites with the tubular part, presented numerous large vessels emitting dark-coloured semifluid blood. The tubular or internal cones were also much darker in colour than natural; and only when well-washed or macerated acquired their usual tint and appearance. The *papillae*, when pressed, emitted always a small quantity of a milky, dirty-looking, opaque, fluid, which appeared to be albuminous urine. This fluid, however, I have also expressed from the renal *papillae* of persons dead of other diseases.

The bladder was in all instances shrunk and contracted to such a degree as to resemble a large fig, or a small apple within the *pelvis*.

2. In the bodies of patients cut off during the stage of *anastasis*, or reaction, the appearances now enumerated underwent in the different organs some modification.

In the first place, the serous membranes, but especially the *peritoneum*, were uniformly covered by a gelatinous viscid exudation, which rendered them very slippery, and might be drawn out in thin ropy threads. This I have already noticed in a slight degree, and in smaller quantity, in the stage of collapse. In that of reaction, in which it was more fully formed and more abundant, it must be regarded as an exudation from the vessels, relieving themselves of the preternatural load by which they were oppressed.

The colour of these membranes was that of the subjacent organs. Thus the *pleura* was of a dark-livid or brown-marbled colour, from that of the lungs; and the *peritoneum* was of some shade of grayish-pink, or faint-red, from vascular injection of the subserous and submucous tissue of the intestinal canal.

The stomach was not by any means so much contracted, nor were the *rugae* of its villous membrane so well marked; indeed, in most instances they were indistinct or entirely wanting. The cavity of the organ in general contained fluid or semifluid matter, often mixed with a considerable quantity of bile. But the most usual appearance in this stage was an abundant quantity of viscid, ropy mucus, very adherent, and more re-

sembling the mucous jelly adhering to the stomach of some fishes, than the ordinary appearance of that of the human stomach. When this was removed by washing, the mucous membrane came into view itself thickened, and in some parts rather softer than natural, but not capable of being detached without force. Indeed, this was more a doughy œdematous softening, apparently from interstitial serous effusion, than destruction of the membrane. Reddish patches also occasionally faintly injected were seen towards the cardiac portion and the large arch; and between the eye and the light much vascular ramification and minute injection could be recognized.

The pyloric ring was less prominent, and the pyloric aperture less contracted and wider, than in the bodies of those cut off in the stage of collapse.

The *duodenum* always contained semifluid pulpy matter, much mingled with bile; and the mucous membrane was covered with viscid mucus, deeply tinged by this fluid. When this was removed, it was in general possible to recognize the duodenal mucous membrane of a faint rose-red colour, chiefly from minute vascular injection of the submucous tissue.

The *ileum* was much less contracted than in the state of collapse; and in some instances, this and the colon were considerably distended by air. In some parts of the canal, especially toward the lower extremity of the *ileum*, the intestine was generally reddened or coloured of brownish red, from vascular injection of its filamentous tissue.

The *ileum* contained more or less pulpy mucous matter tinged with bile, and towards the lower extremity sometimes mere semifluid gruelly matter, without bile, but always with dingy dark bluish-coloured portions, apparently from calomel or blue pill. More frequently, however, especially if life had been continued in imperfect or complete reaction for some days, the contents of the intestinal tube were coloured with dark-green undecomposed bile above, and a more perfectly decomposed bile below. The mucous membrane of the *ileum* was immediately covered by a thick layer of viscid adherent mucus, thoroughly tinged with bile, so as at first sight to look like that fluid. When this was removed by washing and affusion of water, the mucous membrane appeared in general a little thicker than natural, but certainly not softened. The *villi*, however, were more distinctly developed than during the stage of col-

lapse, and also than in ordinary subjects. The *valvulae conniventes* were always well-marked above, but began to become less numerous, less regular, and smaller towards the lower extremity of the intestine.

The agminated glands were always rather distinct, sometimes elevated and injected or reddened, and the isolated glands were also perceptible in the shape of miliary granules of the size of pin-heads. The intermediate mucous membrane was also reddened, though not remarkably, but never abraded or eroded.

The *pericardium* always contained more or less serous fluid ; and the membranes, as well as the mediastinum and the adjoining parts of the *pleura*, were much injected.

The origin and arch of the aorta were strongly injected, and reddened with minute blood-vessels ; and this vascular injection, which was in the filamentous tissue of the sheath, and in the *vasa vasorum*, was continued up the *innominata* and its branches, and the left subclavian and carotid into the neck on each side. In those subjects who lingered long in the stage of reaction, this injection was browner and more deep than in those cut off early or during collapse. It was occasionally, but more rarely, accompanied with ecchymotic spots,—a circumstance from which I infer that these ecchymotic spots are the accompaniments of a more violent and irrecoverable form of the disease. This is also corroborated by the fact, that rarely were these spots seen on the right margin of the heart in those cut off during reaction.

The right auricle and ventricle were invariably very much distended ; and when laid open, were found to contain large *coagula*, bloody and albuminous, which were closely implicated with the *musculi pectinati* of the former, and the *columnae carneae* of the latter, and always sending a large fibrinous *coagulum* on the left side of the tricuspid valve into the pulmonary artery. These *coagula*, which were firmer and more consistent than those found during the stage of collapse, I was disposed, like most pathologists, to regard as formed either after death, or in the last efforts of the heart's action during the dying agonies. When, however, I found them in eight or nine instances adhering most closely by a blood-shot or vascular membrane to the *parietes* of the auricle generally, and especially to the *musculi pectinati*, and also to the base of the ventricle

and parts of its *parietes*, and when detached, which always required considerable force, exhibiting a rupture of parts and effusion of blood, I was then disposed to regard them as formed during life, in the stage of collapse probably, and in that of re-action becoming partially organized and attached in this manner to the nearest parts.

Of the extreme difficulty of adducing positive proof of the truth of this view, I am well aware. But I must observe, that, in addition to this anatomical fact after death, I found that in these patients, during life, the action of the heart was heavy and labouring, and its beat dull, as if it contracted not on a fluid which it could expel from its chambers, but on a solid body which was not to be moved, and accompanied with peculiar anxiety and precordial distress. If not one of the causes of death, it was at least one of those which diminished the chance of recovery.

It is important on this point also to remark the different degrees of adhesion of the *coagulum* in the different chambers in which it was found. The part attached to the *musculi pectinati* was invariably most firm and consistent, presented the most evident traces of organized membrane, and adhered so intimately, that it could not be detached without laceration. The portion adhering to the *sinus venosus* was also very firmly attached, and in several cases, perhaps four or five, could not be detached without rupture. The portions attached to the auriculo-ventricular margin and the base of the ventricle were still firm but less adherent than those in the auricle. Those within the ventricle were attached chiefly by their implication with the *columnæ carneæ* and *chordæ tendineæ*, but also in some degree to the *apices* of the tricuspid valve. And, lastly, that in the pulmonary artery, which was always more fibrinous than the other, and less blood-shot, adhered either loosely, or not at all, and was a mere mould of the vessel.

The left auricle, which was small, contained generally an imperfect small *coagulum*, more gory than coagulated; and the ventricle generally contained a similar very small *coagulum*, loose and grumous, and rarely filling the cavity, which, however, was small. The *parietes* of this ventricle were rarely so firm, hard, and constricted as in the bodies of those who expired in pure collapse; and the whole substance of the organ was softer and more flaccid.

The *pleuræ*, both pulmonary and costal, were much and minutely injected; and a little serous fluid, tinged slightly red, was generally found in the cavity.

The tracheal membrane was of a red-brown colour, and traversed by numerous minute vessels. The *trachea* and bronchial tubes contained much reddish brown viscid mucus, which was also found in, and expressed from, the minute divisions of the bronchial tubes, though in a more fluid and less viscid form, in the shape of frothy reddish mucus. The pulmonic tissue, or proper substance of the lungs, was of a deep reddish brown, more compact than natural, doughy and inelastic, and in some parts approaching to the aspect and consistence of liver.

These appearances must be regarded as the effect either of the continuance of the state of collapse, or of the succession of reaction to that state; for in all the cases in which I observed it after death, I had ascertained during life the presence of a congestive degree of peripneumony and *bronchitis*, by the presence of laborious and inefficient respiration, incapacity to fill the lungs, violent and oppressive mucous rattle, and impairment or absence of the respiratory murmur in the centre of the demithoracic region. This condition, I conceive, is one of the results of the long-continued accumulation and stagnation, perhaps, of the blood, deprived of much of its serum in the branches of the pulmonary artery and veins; since we can scarcely suppose the substance of the lungs to become so much reddened and embrowned in twelve or eighteen hours after death, without the previous congestive state of the pulmonary vessels during life. Several patients appeared to die with rapid and oppressed, or languid and inefficient respiration, more from this asphyxiated state of the lungs than any other. In other instances it was combined with the symptoms of affection of the brain; but in all cases it proved one of the most formidable disorders to combat and remove, and contributed materially to the fatal termination. With such a state of the lungs there could be no respiration; and during the latter state of reaction this function was extremely interrupted and impaired.

In the head the chief changes in this state were a more advanced stage, and a more extensive degree, of the appearances remarked in the bodies of those cut off during the stage of collapse.

Thus the subarachnoid infiltration was more abundant and

more opaque, and formed conspicuous whitish gray ridges over the *sulci* at the upper part of the hemispheres, and whitish patches over the commissures of the optic nerves, the pisiform bodies, the intercrural *fossa*, and in the angle between the *cerebellum* and spinal bulb.

No great difference could be recognized, however, in the degree of injection and vascularity of the *pia mater*, unless that it was, if possible, more minute, and communicated a more general redness to that membrane and to the convoluted surface of the organ.

The substance of the brain was also more vascular, and presented a still greater number of apertures and fissures emitting blood. The convolutions were in some cases tinged of a faint rose-red, and points of them seemed rather softer than natural. But the part that was most coloured was invariably the annular protuberance and *crura cerebri*, which in this stage showed a faint rose-red coloration, as if from the sojourn of the colouring matter of the blood in its vessels. The capsules also of the *corpora rhomboidea* of the *cerebellum* were always much redder than the surrounding parts, and than they are naturally.

Lastly, the ventricles were invariably distended or dilated with from four or five to six drachms, or even an ounce or an ounce and a half, of serous fluid. In one case, this effusion had elevated the *fornix*, and expanded and extenuated, but not broken, the *septum lucidum*,—an accident which, I have elsewhere remarked, is always the result of great accumulation of fluid in the ventricles.

Much fluid was in like manner found in the *theca* of the spinal chord and beneath its arachnoid membrane, especially at the atlantal and lumbar regions. In two instances slight softening had taken place in the spinal chord. Its chief morbid appearance, however, was augmented vascularity and rubescence of its gray central pillar.

The vascularity and congestion of the liver and spleen were always considerable; but the substance of the liver was in several instances dry and doughy; and it was the blood-vessels of that organ only which were congested.

The exterior surfaces of the kidneys were very much marbled, and their granular matter was always redder and more injected than natural, and presented numerous vascular pores

at the union of the granular with the tubular part. The tubular part was always very much congested and dark-coloured.

3. I now proceed to enumerate those lesions and morbid changes found in the bodies of those cut off by cholera, which must have preceded the appearance of the disease, and which, existing, as they did, in very different organs, had no connection with the choleric symptoms, but nevertheless rendered the chance of recovery much less likely.

It was, in the *first* place, very common to find the heart and vascular system and the lungs more or less diseased. The left ventricle was very frequently affected with thickening and contraction of its chamber, the *concentric hypertrophy* of M. Bertin; that is, the deposition of new matter had taken place chiefly in the internal and central direction. This was observed in two-thirds of the adults. In two cases only did I find the left ventricle dilated and hypertrophied, or presenting the *excentric* or aneurismal hypertrophy of M. Bertin. The substance of the heart in the former cases was firm; but in the latter flaccid.

In a very great number of cases the aortic semilunar valves were indurated and thickened; and there was not a single case of an adult in which the proper aortic membrane was not affected by steatomatous, atheromatous, or osseous deposition, commencing generally at the beginning of the aorta, and appearing in opaque irregular patches at the origins of all the arteries, the coronaries, *innominata*, carotid, and subclavian arteries, and rendering the inner membrane, which was elevated and irregular, lacerable and liable to be ruptured by the mere impulse of the blood. In two instances the aortic arch was dilated and enlarged. In one case the coronary arteries were ossified throughout their whole course. In all the cases of adults the arteries of the brain had begun to become opaque by the steatomatous deposition in patches or points. This was most frequent in the internal carotids at their emergence from the carotic canals, in the vertebinals, and in the basiliary artery. Patches also were seen in several cases in the arterial canals of the circle of Willis.

It is well known that this steatomatous or tyromatous deposition is observed principally in those who have been addicted to the use of spirituous liquors, if young or middle-aged, and is

very frequent in advanced life, even in those who have not indulged very freely in these fluids. It is found also associated with apoplexy, palsy, pulmonary hæmorrhage, and all those disorders in which the vascular system is liable to preternatural injection, congestion, or effusion of blood.

The existence, therefore, of this degeneration in the bodies of those cut off by cholera adds another to several confirmations of the principle, that cholera selects its victims among those chiefly whose organs are already diseased.

In the pulmonary organs various morbid changes were recognized. In one case, the *pleura* investing the *apex* of both lungs was thickened and converted into smooth cartilage, or a polished substance as fine as bone. In the one case the *pleura* investing the *apex* of the right lung was in like manner indurated, thickened, and almost ossified; and in another, the *pleura* covering the same part was also in a state of cartilaginous induration. In another case it was extensively asperated by numerous military tubercles. Adhesions of old date, and of greater or less extent, were very common, and were observed at least in three-fourths of the cases.

In one-fourth of the cases there were calcareous concretions in the lungs, and I think I generally traced them to branches of veins,—a fact which, if verified by others, generalizes our knowledge of these bodies, by referring them to the general head of *phlebolites* or vein-stones. Ordinary tubercular induration at the superior part of the lungs was found in one-fourth of the cases.

The substance of the liver was rarely in a state of perfect integrity. However much its vessels were loaded, its proper glandular substance was dry, doughy, and altered in colour. Incipient *cirrhosis* or yellow degeneration was a very common appearance. In a boy of 10, who died in the stage of reaction with severe and uncontrollable affection of the brain, the liver was indurated generally in its whole substance, and presented various minute circumscribed portions of a fawn-coloured matter, extremely firm and solid. The left lobe was so hard as to grate under the knife; and its interior substance consisted of irregular-shaped globular masses of a pale red or orange colour, in some instances gray, in which no trace of the original structure of the organ was recognized.

The spleen presented in several cases induration of its outer

tunic, and in three or four cases minute concretions in its substance, most probably belonging to the veins of the organ.

The pancreas presented nothing very unusual. In several cases, at least eight or nine of the adults, the pyloric extremity of the *duodenum* was irregular and indurated slightly, apparently from chronic irritation of its glandular apparatus.

In six cases the mucous membrane of the colon was very much diseased. In two of these it was thickened, extremely dark-coloured with the blood in its vessels, which passing through the submucous tissue were large, numerous, and distended; and though after immersion in water, a large proportion of this coloration was destroyed, when the membrane was brought into view, it presented numerous elliptical and circular breaches of surface, varying in size from a pin head to a garden pea, or even the area of the section of a small bean. In two others there were large oblong breaches of the mucous membrane, irregular in shape, but affecting chiefly the oblong elliptical, one inch broad, and sometimes two and a half or three inches long. In one of them, though there was complete destruction of the mucous membrane in several large patches, its place was partly supplied by an irregular tubercular sort of growth of a wood-brown colour, and which could be removed by the forceps, and then bore the appearance of a false membrane or new growth.

The organs most frequently and remarkably diseased in both sexes and at all ages were the kidneys. In these were every gradation and variety almost of granular disease. In every case almost the exterior surface of these glands was more or less deeply fissured and lobulated—approaching in this respect the original type of the foetal structure. Not a single case occurred in which this surface was not more or less marbled, mottled, and congested with blood. In at least nineteen cases the external cortical matter was unusually marbled and variegated with whitish patches, and harder than natural; and in several the cortical matter encroached on the tubular to a degree that indicated absorption or destruction of the latter. In five instances the cortical matter conversely was unusually thin.

The tubular part of the organ was generally itself much redder and more injected than in healthy subjects. In two cases in which it was much indurated and preternaturally firm, the cortical part was soft, flaccid, marbled, and attenuated.

The kidneys of one individual presented the most remarka-

ble assemblage of serous cysts I have ever witnessed. Not only was the surface of each kidney thickly studded with these cysts, which were various in size, from that of a garden pea to the magnitude of a grape, or even a large gooseberry ; but the interior substance was occupied through its whole extent, so that a section of it rather resembled a piece of *breccia* or plumb-pudding-stone than a kidney. The figure of these cysts was spherical or oblong-spheroidal ; and they consisted of a thin semitransparent membrane, sometimes traversed by blood-vessels, occasionally not, containing a limpid fluid, or a fluid tinged slightly yellow or bluish-red. Though similar to what are named hydatids they presented none of the characters of these parasitical animals.

The womb and ovaries were always more or less diseased in the females cut off by cholera. The neck and orifice of the uterus were in several cases indurated to an extreme degree. The ovaries were not in a single case, either young or old, free from morbid change. Vesicular serous cysts of various sizes, bloody cysts, tubercles, or indurated masses were found in every one of the cases inspected. In the whole of the cases, also, the peritoneal tissue of these bodies was rough on its surface, and thickened and indurated in its substance, indicating the previous existence of inflammatory action at a remote period.

The lesions now enumerated it is important to distinguish, not as illustrating the morbid anatomy of cholera, with which they are in no immediate way connected,—but because they show that in all the cases in which that disease is fatal, some great and signal change exists in the texture of some important organ, and consequently, that in these cases the system possesses in itself those essential morbid principles which determine the developement of disease, dynamic or organic, in one or more of its constituent organs. They show that the individuals cut off by cholera must at no remote period have fallen beneath the slow and insidious but sure influence of organic disease ; and that cholera had merely anticipated by a year or two, probably much shorter time, the extinction which must have resulted from the continuance of an affection of the heart or lungs, or disorder of the intestinal tube, or an incurable lesion of the kidneys or *uterus*.

PATHOLOGY.—During the prevalence of the epidemic cho-

lera, from 1817 to 1836, in our Indian dominions, from which the above description is derived, much has been done to elucidate the nature of this disease. In the reports of the three Presidencies, in the writings of Mr Annesley, and in the various publications in European countries to which the epidemic gave rise, the researches, instituted with this view, are found. And from these sources, we learn certain facts regarding the state of the skin, of the circulation, and of the intestinal discharge during life, which, combined with what is known regarding the appearances in the dead body, may perhaps throw some light on the nature of this rapid and fatal malady.

The first, and perhaps the principal part of the morbid process of cholera, appears to consist in a forcible, and as it were, spasmodic accumulation of a great proportion of the blood in the vascular system of the gastro-enteric mucous surface, from the stomach to the neighbourhood of the rectum. That there is accumulation in this part of the vascular system is to be inferred from the pale, cold, shrunk, and contracted appearance of the whole surface, which is manifestly deprived of its usual supply of blood; from the suspension or suppression of the natural secretions, carried on in the mucous surfaces, the saliva, pancreatic fluid, bile, and urine; and from the branches of the coeliac and mesenteric arteries being loaded after death with thick, dark-coloured, and tar-like blood.

That this accumulation is forcible, is to express only the fact of the violence of the symptoms which indicate it. And when it is termed spasmodic, it is only because no other epithet occurs to distinguish the irresistible violence of that action by which the blood appears to be retained in this part of the vascular system.

But the process of cholera consists not in accumulation only. There is, in the second place, by a peculiar action of the vessels of the gastro-enteric mucous membrane, a sudden separation from the serous part of the blood of an enormous quantity of watery fluid, which constitutes the principal part of that discharged from the stomach and bowels. In consequence of this separation, the proportion between the two great constituents of the blood, the clot and the serum, is entirely altered. The blood, deprived of its serous part, becomes less fluid, and utterly incapable of moving through the arterial branches. It is in this state that if a vein be opened, it trickles in a dark,

tarry stream, and more resembles, by its diminished fluidity, molasses, tar, or such viscid substance, than the movable and fluent liquid of the blood-vessels.

It is also possible that the clot itself may have undergone some change; although no experiments have been adduced to establish this; and the fact of the blood recovering its healthy fluidity after part of it has been discharged, is rather against this idea.

That this decomposition, as it may be named, of the blood, is a matter of fact, appears from the following circumstances. The blood of persons affected with cholera is unusually black or tar-coloured, and is thick, or ropy, like syrup, and is said by competent authorities to present a semicoagulated appearance, and this both in arteries and in veins.* Blood drawn from persons in cholera presents either a very small proportion of serum, or no perceptible quantity.† This change in the condition of the blood is fully proved to be in the ratio of the duration of the disease; the blood at the commencement being nearly natural, but becoming thicker and more dark-coloured as the disease advances.

It is to this viscid condition and imperfect fluidity of the blood that the early cessation of pulse in the extreme arteries, and the general stagnation through the vascular system, are to be ascribed. Its ropy thickness prevents it from flowing along the minute arteries, while it is still capable of moving sluggishly in the large trunks. To the same cause is to be ascribed the difficulty it experiences in passing through the lungs, the oppressed and languid respiration, and the consequent dark colour and imperfect arterialization. If the experiment of Dr John Davy is correct, and the breath is actually deficient in the proportion of carbonic acid,‡ the fact admits of explanation on the same principle.

Since cholera made its appearance in Europe, the discharges of the alimentary canal have been examined chemically by various chemists.

Hermann of Moscow gave the first analysis of these discharges. He found in 1000 parts of the matter vomited, 990 parts

* Madras Report, xxix.

† "The blood drawn from patients suffering under cholera is stated to be generally very destitute of serum; never to exhibit the appearance of buff; and to be generally disposed to coagulate quickly."—Madras Report, xxix.

‡ Medico-Chirurgical Transactions, Vol. xi. p. 158.

of water and mucus, 6 parts of animal matter analogous to osmazome, 1 part of salivary matter, and about $1\frac{1}{2}$ of acetic and hydrochloric acid with soda, and a very small proportion of phosphoric acid. This shows that the fluid ejected by vomiting resembles in general characters the gastric juice.

The matters discharged by stool during the established period of the distemper, the same chemist found to consist of albumen, free acid mostly acetic, matter analogous to osmazome and mucus, and a large quantity of water. The albumen, M. Hermann is inclined to regard, as mingled with pancreatic fluid, and a little bile, and rice-water.

The dejections of patients in the confirmed stage of cholera were examined by my friend, the late Dr Turner, from specimens forwarded from Newcastle by Dr Cobb of London; and found by that chemist to consist chiefly of serous fluid, containing a small quantity of albumen and a large proportion of saline matter. The density of this rice-water fluid varies from 1.008 to 1.011 compared with water as 1.000. The saline matter appears to be either hydrochloric or phosphoric acid, with an excess of soda and potash.

A natural question arises, whence this sero-albuminous excretion proceeds, whether it is formed at the expense of the blood?

Hermann ascertained that the specific gravity of the blood and serum of the blood in cholera is rather above that of the healthy state, the density of the former being 1036, while that of the latter is from 1023 to 1027; and from this he infers, that the serum in cholera, and consequently the blood, is deprived of water. According to the experiments of the same chemist, the clot gives an acid, while the serum gives an alkaline reaction,—a circumstance which, he thinks, is explained by the property possessed by the fibrine, of entering into combination with acids without saturating them. Dr Thomson of Glasgow found the density of cholera blood even higher, viz. 1.057.

Dr Christison found the serum of blood drawn during the presence of violent symptoms of cholera to vary in density from 1.038 to 1.045. In one case, in which blood was drawn during reaction, the density of the serum was 1.060.

Dr Turner found that the serum of the blood in cholera is deficient in saline matter, and that it contains less water and more albumen and hematosine than healthy blood.

These results correspond in general with those obtained by Dr Christison, who found the blood drawn in cholera to contain less water than healthy blood by 53 parts in the 1000, but more colouring matter (hematosine) by 29 parts; more albumen and salts by 24 parts; and only about .5, or half a part in the 1000 were fibrin.

From all these facts it may be confidently inferred that, in established cholera, the sero-albuminous discharges are forced from the blood by urging out of it a large proportion of its serum and saline matter. This change in its constitution is one cause of its loss of fluidity and its peculiar tarry viscid appearance; and has led Hermann to infer, not without reason, that the liquids discharged during cholera, both from the stomach and the bowels, are the constituent parts of the blood, and that by their disappearance the blood had been decomposed.

The suppression of the secretions, and especially of the urinary, suggested that urea might be found in the blood; and though Markus did not recognize this principle in the analysis at Moscow, it was found repeatedly by Dr Christison in the blood of cholera patients in Edinburgh, when dying with symptoms of coma. In many cases also in which recovery took place, the urine was albuminous, and less dense than natural.

Though I submit this generalization of some of the chief facts relating to cholera, I do not propose it as a perfect theory of the disease. The reason of the mesenteric congestion and of the intestinal secretion is still unexplained.

The mortality of cholera varies from 38.5 to 58.6 per cent.

ETIOLOGY.—The remote causes of cholera, epidemic or sporadic, are little known. The connection of the disease with a peculiar hot state of the atmosphere, and with those alternations of cold and humidity which occur in such atmospheres, has been already mentioned; and this is almost all that can be said. In the various countries of Asia, it has prevailed successively and epidemically for the space of six or seven years. Originating first in Hindostan in 1817, it spread eastward to the Burman empire, China, and the Phillipine Islands, southward across the Indian peninsula, and ultimately to Mauritius and Bourbon; to Persia and Turkey westward; and latterly it appeared in the Russian empire on the eastern confines of Europe; thence spread successively over Poland, Hungary, Germany, Great Britain and France, in the course of 1832 and 1833; and afterwards appeared on the American conti-

ment. A malady so comprehensive in its motions, it is to be inferred, must depend upon causes of very general operation. Yet, after the most vigilant observation of its progress and course, in which its appearance has been traced with the greatest attention, it cannot be said that we have succeeded in discovering any single principle on which its appearance, at different places, successively or simultaneously, could be reconciled. Contagion is out of the question; and when it is said that it depends on epidemic constitution or influence, we give no explanation, unless expressing what is obscure by what is unknown be entitled to this character.

Cholera, however, is not a new disease.

From various historical facts elsewhere stated, I conceive the following conclusions may be deduced.

1st, It appears that a disease distinguished by profuse and irresistible vomiting and purging of serous, sero-albuminous, or sero-sanguine fluids, and cramps of the legs and arms, followed rapidly by small or even imperceptible pulse, shrinking of the features, depression of the eyes and temples, more or less of a dingy, leaden or blue colour of the surface, with cold extremities, cold sweats, suppression of urine, fainting and death, was known to Aretæus, Asclepiades, Soranus, Cœlius Aurelianus, Alexander of Tralles, and other ancient physicians.

2d, That a disease of the same character was known to several of the Arabian physicians.

3d, That, though the term *cholera* did not convey to the minds of most of the ancient physicians the idea of bilious evacuations, the appellation has misled others of them, and especially several of the modern physicians, in making it be supposed that the characters of the disease were a discharge of bile from the stomach and intestinal tube.

4th, It appears, that, notwithstanding the influence of this mistake, several physicians of the latter half of the 16th and the early half of the 17th centuries, as Houillier, Le Poix, Sanchez, Sennert, and Abraham Zacutus *Lusitanus*, had sufficient originality and independence to disregard the definition derived from the current etymology, and to assert, according to their own observation, that the fluids discharged were watery or serous, and proceeded not from the liver, but from the vessels of the stomach and intestines; that Zacutus *Lusitanus*, Vander Heyden, and Morton, especially observed that the discharges were in severe cases albuminous or milky; and that all these

authors had witnessed the assemblage of aggravated and exquisite symptoms denominated *collapse*.

5th, It appears that though Bontius describes the disease as more intense, more rapid in progress, and more certainly fatal in the East than in Europe, Van Lindshoten is the first voyager who mentions the disease under its Indian name, and Zacutus Lusitanus, to whom these peculiarities were known, is the first medical writer who in Europe mentions the distemper by its Indian or Indo-Portuguese appellation. It farther appears, that this term is afterwards currently used by Mandelsloe, De Thevenot, Dellon, and others, to Girdlestone and Curtis; and that Sonnerat, in his wish to give it a French origin, had converted it into *Mort de Chien*; an error in which he has been followed by Curtis and some other English authors.

6th, I have now to observe that the term *Mordechim*, *Mordexim*, or *Mordechin*, which has been so differently written by European authors, and so strangely corrupted by Sonnerat and Curtis, is a word of Persian origin used by the Hindoos, and adopted from them by the Portuguese. It is not found in D'Herbelot; and though adopted in the Portuguese dictionaries, no etymological explanation of it has been given. I think it cannot be doubted that it consists of the two roots مردن *to die*, or *death*, or مردۀ *dead*; and خیم which, among its other significations denotes the *bowels*, and consequently was used by the natives, as if to signify *bowel-death*. From the compound Indo-Persian term مردخیم the Portuguese must have adopted by the ear, the term *Mordexim*, pronounced as *x* always is in that language like the guttural *ch*. This derivation, which I conceive to be the just one, shows, that the name ought to be written *Mordechim*, or *Murdechim*, or, if the Portuguese form be adopted, *Murdexim*. It is superfluous to remark how expressive the name is of the character of the malady.

7th, It is a historical fact established by the clearest evidence, that epidemics are mentioned by Sonnerat previous to 1774, and that subsequently, we have evidence of sudden outbreaks attacking large and multitudinous bodies of human beings, in 1780, 1781, and 1790. More early mention of epidemics might, no doubt, be found in the native records.

THERAPEUTICS.—The treatment of cholera varies according to the mild or severe form of the disease.

I. Of European cholera, which is milder and more manageable, the treatment has been long established by experience. It consists in the exhibition of opiates in large and repeated doses by the mouth or by glysters, and in the use of mild diluent liquors.

The best and most commodious form for the exhibition of opium is that of the thebaic pill, in which it is combined with aromatics. Two of these should be swallowed immediately, and, unless the vomiting and purging cease or abate sensibly in the course of an hour, the same quantity may be repeated. If the incessant vomiting hinders these from being retained in the stomach, the starch-opiate glyster, containing one drachm and a-half of tincture of opiate, should be administered without loss of time. This is generally followed by abatement of the vomiting and purging, and disappearance of the spasms; when the remedy may be given by the mouth.

Diluent has been generally recommended and given in this disease, with the view of diluting bile, and defending the intestines from acrimony and irritation. In many cases, however, no bile appears; and the irritation arises chiefly from the sero-mucous fluid which scalds the intestinal mucous membrane. When the secretion of this is suspected by opium, irritation abates; and as the opiates increase the cutaneous heat and moisture, the internal or mucous sensibility disappears. Diluents, however, are useful in increasing the heat of the surface, and promoting the cutaneous moisture. The vegetable ptisans are the most useful; and the most effectual of these is a decoction or infusion of oat-cake, which has been previously toasted as brown as coffee. This ptisan, which is both palatable and safe, should be taken freely as the patient inclines; and in general it agrees better with the stomach than any of the other vegetable infusions. (Dr Douglas in *Medical Essays and Observations*, Vol. vi. p. 141.) Decoction of barley, or groats, or common toast-water, is also used; and some have recommended weak mutton broth, with the view of defending the intestines; but it is in mild cases only, or after the severe symptoms have disappeared, that the stomach can bear such a remedy. Infusion of mint, balm, sage, or ginger, are also recommended; but none of them seem so effectual as the oat-cake water.

When the urgent symptoms have disappeared, weak beef-tea, chicken soup, or veal-broth with a good proportion of spice, will be useful in restoring strength and tone to the stomach and bowels; and infusion of calumbo root, or the use of the Peruvian bark with good nutritious food, and the occasional use of opiates, will contribute to restore the exhausted strength.

Some are fond of giving purgatives, with the view of expelling offending matter. But they should never be giving while the vomiting and purging last; and if they are requisite, it is only in combination or alternation with opiates, when these urgent symptoms have disappeared.

The warm bath, when it can be employed, is useful in restoring the heat of the surface and favouring the operation of the opiates.

II. The treatment of the Asiatic form of cholera is not so well established; but I shall state shortly that which has been found most efficacious.

It appears, that in the incipient stage of the disorder, and in some mild cases, recovery takes place under the use of very trivial remedies. Thus cures appear to have been effected under the use of laudanum, spirits, brandy, arrack, hartshorn, ether, and such diffusible stimulants; which we know are nearly inert in the confirmed and exquisite forms of Asiatic cholera.

It appears further, that, in the established form of the disease, the most successful remedy is blood-letting, practised seasonably and to sufficient extent. According to the view already given of the morbid changes which accompany the disease, the blood is preternaturally viscid, and is unable to flow through its vessels, and unfit for the several uses of circulation. The great indication, therefore, is to diminish this viscidness of the blood, so as to enable it to flow through the lungs and other organs. This it is impossible to do directly; but it may be done indirectly by diminishing its volume, when the force of the heart is more able to propel it through the system.

Whether this is the sole, or even the principal mode in which blood-letting proves beneficial, it is difficult to say. It has been further ingeniously maintained that, as deficient arterialization or oxygenation makes part of the preternatural state of the blood, evacuation, by diminishing its quantity, enables

the lungs more easily to effect the requisite change on the rest. On the accuracy of this opinion, we feel it difficult to speak. But it is certain, that, unless the blood become more fluid than it appears in confirmed cholera, it never can flow to the extremities of the pulmonary artery so as to undergo the necessary change.

To render blood-letting beneficial, it must be practised early, and to a great extent. It should be drawn in the first stage of the disease before the blood has entirely lost its fluidity ; for the longer the operation is delayed, the more difficult is it to make the blood flow. If it ceases when a few ounces are drawn, and still retains its dark-coloured appearance, little hope can be entertained. More commonly, however, it assumes a redder tint, and flows more readily ; while, at the same time, the rising of the pulse and the return of heat to the skin, indicate that it is already becoming more fluid, and flowing in the proper direction into the extreme arteries.

No rule can be laid down regarding the quantity to be taken, unless that it should be allowed to flow till it becomes red, and till the pulse returns and becomes distinct. This will rarely happen before twenty ounces are drawn ; and more frequently the quantity will amount to thirty or more. In one severe case, Mr Annesley bled in the course of five hours to the amount of forty-six ounces at two venesections, and fifty-seven ounces by leeches, with the most favourable effect. That the remedy is not only free from danger, but more powerful than any other, is manifest from the experience of the same Asiatic epidemic. Mr Boyd, assistant-surgeon at Mhow, in the worst possible cases, bled his patients to deliquium, and lost only two out of twenty-eight, (*Madras Report*, p. 95) ; and Mr Annesley, out of fifty patients removed into his hospital from the General Harris East Indiaman, did not lose one. (*Sketches, &c.* p. 172).

When blood cannot be drawn by the lancet, then it is to be tried by means of leeches, which in India are remarkable for their size and power, and may draw upon an average an ounce each. When both means fail in abstracting blood, it seems most proper to try the use of stimulants, external and internal, and all means of restoring animal heat, and bringing the blood back to the vessels of the surface.

Blood-letting in the early stage was extensively tried in Edinburgh and the neighbourhood. I always found it most

beneficial whenever the pulse was quick and oppressed, and the epigastric region painful and oppressed, and the respiration becoming rapid,—in short, immediately before the approach of symptoms of collapse. But if delayed till that stage had commenced, it exerted no beneficial influence; and there was reason to believe that it might be hurtful.

A dread seems to be entertained of using the warm or hot bath, in consequence of the fatigue which it is supposed to cause the patient, and because of the strong impression which the hot water is believed to make on the cold skin. Properly, managed, however, it appears to be the most valuable remedy next to blood-letting which can be employed; and in cases in which the blood has not flowed, or has ceased to flow from suitable orifices, either by the lancet or by leeches, the best plan is to immerse the patient in a bath at 95° or 97° Fahrenheit. Dr Burrell was in the habit of ordering a hot-bath of the temperature of 110° Fahrenheit, with good effect. (*Medico-Chirurg.* Vol. xi. p. 123). Heat may also be applied by warm flannels, the sand-bath, the spirit-vapour bath, or chuffers under the patient's cot.

Opium appears to have no great power over the symptoms of Asiatic cholera. A mixture of camphor, ether, and ammonia, is recommended by Mr Annesley. But much reliance should not be placed on it. If opium is to be useful, it should be given to the extent of from two to four grains every hour, or to the amount of eighty or a hundred drops of the tincture; taking care, however, that narcotism be not produced. Or one scruple of Dover's powder may be given immediately after blood-letting.

Calomel has been much tried as a remedy in Asiatic cholera, but with very variable success. Mr Corbyn, who first introduced it in the treatment of this disease in scruple doses, commends it highly, and represents it as producing a sedative effect, allaying vomiting, removing spasm, and inducing sleep. (*Medico-Chirurgical Trans.* Vol. xii. p. 122). Mr Annesley concurs in these views, and upon the fact both of its trial on the human subject, and in the inferior animals, he ascribes to it a powerful effect in checking the disorder of the intestinal canal, and restoring its secretions to a healthy state. He administered it in doses of twenty grains, with two grains of opium, repeated three or four times every two hours, till an effect was

produced. It is obvious, that, as this mineral was invariably given with opium, it was quite impossible to draw any just conclusion regarding its power as a sedative; and as even Mr Annesley followed it with resinous purgatives, its power in controlling the derangement of the intestinal canal is at least questionable. Mr Scott, on the other hand, had seen reason in the Contributions to the Presidency of Fort St George, not only to doubt its beneficial powers, but even to infer that it was not invariably free from harm. Without effecting any general change, it appears to have operated like a local irritant. "The stomach having often lost its power of rejection, this substance was found coating its internal surface; and when given in boluses, lying imbedded in greenish mucus, marks of inflammation being visible on the spot." Upon the whole, it is probable, that, in the instances of the disease, in which this exhibition of calomel was followed by good effects, the symptoms were either so mild that they were ready to undergo a natural solution, on the mere use of the opium given with the calomel, or, if severe, they were already subdued by more powerful means previously employed. Is there any example of severe and well marked cholera recovering under the use of calomel without the opium?

The best method is to give, either upon the appearance of the first symptoms, or immediately after blood-letting, 10 grains of calomel and one of opium; and in the course of one or two hours, 5 grains of calomel and half a grain of opium; to be repeated at longer intervals, according to the symptoms and effects. After the exhibition of 20 or 25 grains of calomel with the proportion of opium, the sero-albuminous discharges diminish or cease entirely; and the motions become bilious and feculent. Affection of the mouth is not necessary to recovery, and it should not be attempted, as it adds to the sufferings of the patient. The reappearance of bile in the discharges is also promoted by the use of the mild laxatives, as the colocynth pill and castor oil.

Blue pill may be given in the same manner as calomel, either with Dover's powder, or opium at first, and then with the compound colocynth pill.

Anodyne enemata are sometimes serviceable, when vomiting is so urgent that all medicines are rejected. In other cases enemata, consisting of port wine, containing sulphate of qui-

nine, with small quantities of opium or laudanum were most efficacious in retarding the approach of symptoms of collapse, and seemed sometimes beneficial in recovering from that state.

Considerable benefit has been observed to result from irritating the skin of the belly, and exciting an extensive superficial inflammation. This is effected either by sinapisms, blistering plaster or boiling water, or by the application of diluted nitric acid. In the stage of collapse, however, when the skin is very torpid, these applications are often ineffectual in exciting cutaneous inflammation.

There has generally been a prejudice against the use of cold fluids taken as drink by patients labouring under cholera. This prejudice, however, appears to be the result of speculation only; for in practice the use of cold fluids is either harmless, or a matter of indifference. Mr Annesley found that nitric acid agreeably diluted, so far from being injurious, was invariably most effectual in relieving the sense of intense burning referred to the epigastric region.

Another method of treating this disease has been proposed by Mr Henderson, and is said to be attended with success. It consists in placing the patient on his back, with his head particularly low, in a charpey or suspended cot, and administering first one ounce and a half of castor-oil, and giving an ounce every twenty minutes, till the bowels are freely opened by it. The patient is kept in this position by force, and is not suffered to make the slightest motion, till after the operation of the medicine. The object of this is to prevent vomiting, which in Mr Henderson's practice never occurs, when absolute quietude is observed. If, however, vomiting should take place, a few drops of laudanum are given, but the less the better. The effects of the castor-oil do not appear until four, six, or ten ounces have been swallowed; and in one case treated by Mr Forsyth, eighteen ounces were given before a motion was produced. In ordinary cases, however, the operation commenced from one to three hours after the first dose. Even before any evacuation has taken place from the medicine, the circulation is said to have returned to the vessels of the extremities; pulsation became distinct; warmth of the surface followed; and the spasms abating, disappeared soon after the first evacuation. The discharges caused by the medicine were various, more or less fluid, sometimes yellowish, sometimes

consisting of shreds of whitish matter, suspended in a dark-coloured fluid, and never resembling the proper discharge of the disease. Mr Henderson admits that this method of treatment is principally adapted for natives, on whom chiefly it has been hitherto tried. But he is so firmly persuaded of the necessity of operating directly on the intestinal canal, and of the practicability of doing so, that he would pursue the same plan with Europeans; and if he found any difficulty in making the castor-oil operate on their bowels, he would substitute the oil of turpentine in exactly the same dose. The method is certainly worth being fairly tried; but there is reason to believe that its merits are overrated by the ingenious author.

Various other remedies and modes of treating cholera, too numerous to be mentioned, were adopted during its prevalence in this and other European countries. Thus strychnine was given in repeated doses by several foreign practitioners. Dr Stevens strongly recommended the compound saline powder, formerly mentioned, (Vol. i. p. 263,) as well suited to restore to the altered blood its natural properties. Lastly, the same compound was injected into the veins as means of removing the symptoms of collapse, and inducing reaction. Multiplied experience showed, that all these measures, however effectual in acting on certain symptoms, are unavailing in averting the fatal termination of the disorder. In the case of the saline injection, profuse vomiting speedily followed; and often inflammation attacked the vein.

After the urgent symptoms of the disease have been subdued, the insidious symptoms of reaction which frequently follow either in the head in the form of congestion, with delirium, stupor, or coma, or in the chest in the shape of oppressed breathing and struggling action of the heart, or in the belly in the shape of low intestinal inflammation, require all the vigilance and promptitude of the practitioner to detect and control it in due season. The remedies are leeches and cold applications to the head; purgatives and purgative enemata, with leeches to the belly, if there is reason to suspect latent or obscure inflammation; and bleeding by cupping from the loins, with diuretics, if the urinary secretion be suppressed, and the patient be verging to coma.

CHAPTER IV.

COMPLEX DISEASES OF THE GLANDS.

UNDER this head I shall consider only Granular Disease of the Kidneys and Diabetes.

§. I. Granular Degeneration of the Kidneys. Mottling of the Kidneys. *Nephritis Albuminosa*, Rayer. *Albuminuria*, Martin Solon. Renal Dropsy, Osborne and various other authors.

Animadversiones de natura Hydropis ejusque curatione, auctore Francisco Milman, M. D., &c. Londini, 1779.—Observations on the Symptoms and Cure of Dropsies, in Medical Observations and Inquiries. By Benjamin Rush, M. D. In four vols., Vol. ii, p. 153. Philadelphia, 1805.—Observations on the Dropsy which succeeds Scarlet Fever, Art. xv. p. 167; and on the Presence of the Red Matter and Serum of the Blood in the Urine of Dropsy which has not originated from Scarlet Fever, Art. xvii. p. 194. Transactions of a Society, &c. Vol. iii. London, 1812.—Observations on the Nature and Cure of Dropsies, &c. &c. By John Blackall, M. D. 2d edition, London, 1814; 3d edition, corrected and improved, London, 1818.—Clinical Report on Dropsies. By John Crampton, M. D., &c. &c. Transactions of the Association of Fellows and Licentiates of the King and Queen's College of Physicians, Ireland. Vol. ii. p. 140. Dublin, 1818.—Researches into the Nature and Treatment of Dropsy in the Brain, Chest, Abdomen, Ovarium, and Skin, &c. &c. By Joseph Ayre, M. D. London, 1825.—Reports of Medical Cases, selected with a view of illustrating the Symptoms and Cure of Diseases by a reference to Morbid Anatomy. By Richard Bright, M. D., &c. London, 1827. Vol. i. 4to, pp. 230. On Dropsy from Diseased Kidney.—Observations on the Variety of Dropsy which depends on Diseased Kidney. By Robert Christison, M. D., &c. Edinburgh Medical and Surgical Journal, Vol. xxxii. p. 262. Edinburgh, 1829.—On Diseased states of the Kidney connected during life with albuminous urine; illustrated by Cases. Part I. By James Craufurd Gregory, M. D., &c. Edin. Med. and Surg. Journal, Vol. xxxvi. p. 315. Edin. 1831. Part II. Ibid. Vol. xxxvi. p. 54. Edin. 1832.—On the Epidemic Scarlatina and Dropsical Affection which prevailed in Edinburgh during the autumn of 1832. By Mr G. Hamilton. Ibid. Vol. xxxix. p. 140. Edin. 1833.—On Dropsies connected with Suppressed Perspiration and Coagulable Urine. By Jonathan Osborne, M. D., &c. London, 1835. 12mo, pp. 64.—Cases and Observations illustrative of Renal Disease, accompanied with the secretion of Albuminous Urine. By Dr Bright. Guy's Hospital Reports, No. 2, April 1836, London, p. 338—400.—On the Coagulability of Urine as a Diagnostic and Therapeutic sign in Dropsies. By William Mateer, M. D., Belfast. Edin. Med. and Surg. Journal, Vol. xlvii. p. 68. Edin. 1837.—An Account of the Scarlet Fever as it appeared in several of the Charitable Institutions of Edinburgh in 1835, 1836. By William Wood, F. R. S. E., &c. Ibid. Vol. xlvii. p. 97. Edin. 1837.—Lettre sur l'Albuminurie, par M. C. Forget, Prof. de Clinique Med. a Strasbourg, Gazette Med. de Paris, Sept.

1837.—De l'Albuminurie ou Hydropisie causée par la Maladie des Reins, &c. par M. le Dr Martin Solon. Paris, 1838, 8vo, pp. 480.—Inaugural Essay on the Pathological Characters of the Urine, &c. By Edwin Adolphus. Edin. 1838. 8vo, pp. 103. 6 Engravings.—On Granular Degeneration of the Kidneys, and its connection with Dropsy, Inflammation, and other Diseases. By Robert Christison, M. D. &c. Edin. 1839. 8vo, pp. 288.—Traité des Maladies des Reins et des Alterations de la Secretion urinaire ; étudiées en elles-mêmes, et dans leurs rapports avec les Maladies des Ureteres, de la Vessie, de la Prostata, &c. Avec un Atlas in Folio, par P. Rayer, Med. de l'Hopital de la Charité. Tome i. and ii. 8vo, Paris, 1839—1840.

THE disease, of which I am to give an account in this section, consists in a change in the structure of the kidney, especially its cortical or secreting portion, in which it is penetrated with grayish or whitish, or yellowish matter in the form of minute granules, and in which, at the same time, the density of the urine diminishes, and the urine itself contains more or less albuminous matter, the presence of which may be shown by the application of heat, or the addition of any of the acids or the metallic salts.

Cotugno appears to have pointed out in 1764 the fact, that the urine was liable, in persons labouring under dropsy and diabetes, to contain serum or albuminous matter, which underwent coagulation on the application of heat. Mr Cruickshank in 1797 remarked, that the urine in idiopathic general dropsy often contains serum, the presence of which could be readily detected by the application of heat or the addition of nitric acid.

It may be justly doubted whether there be such a disorder as idiopathic dropsy ; for it might be shown that dropsy is in every case a symptom or an effect of some other primary disease, which acts either in deranging the general circulation, or the circulation of some individual organ or part of the body, or the secreting action of one or other of the glands. By idiopathic dropsy, however, here is meant that form of dropsy which is not the effect of disease of the viscera, probably the liver, or of the heart or lungs. It will, nevertheless, appear very clearly, that even the dropsy thus designated idiopathic, is not more than any other entitled to that character, and that it is always, when it occurs, a symptomatic effect of the lesion of the kidneys, which is here to occupy attention.

Dr Blackall, when studying at St Bartholomew's Hospital in 1794, observed in a patient under the care of Dr Latham, labouring under emaciation of the whole body, with cedema of

the right leg, loss of appetite, great thirst, occasional vomiting, and an unusually copious discharge of urine, that this fluid when subjected to a heat of 160° , became uniformly opaque and white, forming a coagulable precipitate, which amounted to one ounce from the quantity discharged daily; (seven pints.) He found also that, upon the addition of nitrous acid, a similar effect resulted. This physician afterwards prosecuted the inquiry, and, as we shall see, employed the test of coagulability and incoagulability to distinguish various kinds of dropsy.

Dr Charles Wells had found in the urine of a man labouring under spitting of blood, slight swelling of the ankles and afterwards pain of the loins, and anasarca, both the red colouring matter of the blood, and a considerable proportion of matter coagulable on the application of heat. He, nevertheless, did not then infer that serum might exist in the urine of other persons labouring under dropsy. To this question, however, his attention was directed in the beginning of 1799, by the circumstance of detecting serum in the urine of persons labouring under dropsical symptoms after scarlet fever. Eventually Dr Wells examined the urine of 130 persons, namely, 95 males and 35 females, affected with dropsical symptoms from other causes than scarlet fever; and he found serum in that of 60 of the males and 18 of the females, or 78 of both sexes.

In about one-third of these cases the amount of the coagulum was small, being only from one-tenth to one-fortieth of the urine in which it was contained. In five cases the urine, after exposure to a boiling heat, became firmly solid; in seven it became a soft solid; and in eleven cases, it was rendered only turbid in a greater or less degree. In one-half of the whole amount of cases of coagulable urine, that fluid presented all the intermediate proportions of coagulable matter.

Dr Wells remarked that, in cases of dropsy with coagulable urine, the patient complained of considerable pains and a sense of weakness in the loins; that the pulse is often large, (that is full and frequent); that discharges of red blood occur from other parts of the body more frequently than in dropsy not attended with coagulable urine; that the saliva frequently contains coagulable matter; and that diarrhœa is often present. The pain of the loins he, in some cases, ascribed to affection of the kidneys.

Dr Wells had little opportunity of ascertaining the correctness or the incorrectness of this opinion, by inspection of the body

after death. He inspected only three cases; and, among lesions of other organs, he found in one, the kidneys much harder than usual, their cortical portion thickened and changed in structure, from the deposition of coagulable lymph, and purulent matter in the pelvis of one of them; and in another, the kidneys larger and softer than usual, and containing several serous cysts. Dr Wells appears to have been deterred from drawing any conclusion between the state of the urine during life, and the state of the kidneys found after death, by the small number of cases in which he had opportunity of inspecting the body, and by his aversion to premature generalisation and the formation of inferences from a small number of facts.

These observations Dr Wells made known in 1811 and 1812. In the meantime Dr Blackall, whose original observation in 1794, has been already noticed, had continued to prosecute the inquiry into the presence of serous fluid in the urine, as an indication of the nature of the disease and the kind of treatment to be pursued; and published in 1813 the result of many years observations. The result of these observations may be stated in the following manner.

In certain varieties of dropsy to be presently specified, and also in land-scurvy (*purpura*), the urine becomes opaque and milky when exposed to a temperature of 160° Fahrenheit, or it may furnish a distinct coagulated mass; in other instances, it becomes opaque, or turbid, or flocculent only when it is subjected to the temperature of boiling water; and the flocculi so formed, when it cools, fall to the bottom in the shape of an insoluble albuminous precipitate. The same changes are produced by the addition of nitric acid, corrosive sublimate, and infusion of galls. In some instances this coagulable urine is tinged red with blood, and portions of lymph are deposited. It may be either copious, forming *diuresis*,—or scanty. In certain cases in which it putrefies soon, it does not affect the vegetable blues. In other cases it is void of the usual sensible properties of urine, is clear and watery, probably deficient in urea, imperfectly neutralised, and reddens litmus paper.

This state of the urine may be either attended or not with dropsical symptoms. Sometimes they are slight, or the face and complexion are pale, clear, and leucophlegmatic.

In the majority of cases the blood drawn shows a thick firm buffy coat, generally strongly cupped; and the serum may be

white. At the same time there are various indications of inflammation in internal organs. Thus, purulent matter is expectorated from the lungs with coughing. Pain and uneasiness may take place in one or both sides, with breathlessness. Pain may take place in the abdomen, with fulness and swelling. These appearances may ensue on the use of one or more mercurial courses, on exposure to cold while heated, especially drinking freely of cold water, and after scarlet fever.

Though the urinary organs are often free from any appearance of morbid structure, in mercurial cases, they may be firmer than natural, and in others they may be thickened and confused in structure. The most common appearance is an inflammatory state of some serous membrane, particularly the pleura, which is covered with lymph or filled with purulent matter, and a firm tense swelling of the subcutaneous cellular membrane, and unusually painful, as if it had been the seat of erysipelatous inflammation.

These circumstances led Dr Blackall to regard the human frame as in an inflammatory state while the urine is albuminous, and to regard all those cases of dropsy in which this state of the urine is observed as originating in, or connected with, inflammation, and hence to have recourse to antiphlogistic remedies.

Dr Blackall appears to have been prevented from establishing any conclusions as to the connection of the albuminous urine with any morbid state of the kidney, by the small number of inspections (nine), and by feeling the uncertainty of drawing general conclusions from a small number of facts. Although, therefore, the general result of the researches of Dr Blackall was to establish a clear and evident distinction, both in pathology and treatment, between dropsies with inflammatory symptoms and those without such symptoms, yet no connection was established between the serous state of the urine and any morbid condition of the kidney. This was accomplished, however, in 1827 by Dr Bright.

It was partially known to Morgagni, that the kidneys were liable, in anasarca, to a certain change in structure, in which their two component parts, the cortical or secreting and the tubular or excreting, became, as it were, blended or confused together, and often contained small serous cysts or vessels. I have already shown what was ascertained on this point by Dr

Wells and Dr Blackall, and to what length they advanced. In the report published by Dr Crampton on dropsies, in which that author showed the frequency of inflammatory products, in connection with dropsy, in the only three cases in which the kidneys were examined, they are stated to have been enlarged and soft. In an interesting paper by Mr James of Exeter, containing the symptoms during life and appearances after death, in nine cases of different diseases of the heart, that author observes that in one case (1.) the kidneys were large and much diseased; in another, (6.) the kidneys are stated to have been very small and much diseased; in a third, (7.) in which the dropsical effusion was a firm and solid œdema, the cortical part of the kidneys was almost white, and much hardened in texture; and in a fourth, (9.) they are said to have been remarkably large, very turgid with blood, but without perceptible disease.

At length, in 1827, Dr Bright published twenty-four cases of dropsical effusion, with more or less serous or albuminous matter in the urine during life, and in all of which the substance of the kidney, chiefly its cortical part, was found changed, viz. either of a gray or fawn-colour, larger than usual, and thin, soft, and flaccid, or smaller than usual, and firm and hard, mottled on the surface, or irregularly tuberculated.

The general correctness of the inference regarding the connection between serous urine, and more or less disease of the kidney, was speedily confirmed by Dr Christison and Dr James C. Gregory in this country, by Dr Osborne in Ireland, and by Solon and Rayer in France.

The facts ascertained by these observers must be allowed, not only to have established the fact of the connection between albuminous urine and different degrees and stages of disease of the kidney, but to have thrown a considerable degree of light upon the disease in general, and to have shown that dropsy, as well as the several inflammatory and congestive states of the disorder, are mere secondary or symptomatic effects of the change in the structure of the kidneys, and the corresponding change in the function of these glands. In the following section I shall describe, first, the anatomical characters of the various forms in which the disease of the kidney appears, then enumerate the symptoms, endeavour to explain the causes, and lastly, present a view of the treatment.

I. MORBID ANATOMY.—The texture of the kidney, especially its cortical portion, is liable to become changed in various modes, and it presents in the different stages of each different appearances.

It is rare to observe kidneys in the first stage of this disease in any of its forms, as it is not at that period by itself fatal ; and it may be doubted whether it has been seen in the incipient stage. The following varieties, however, may be regarded as the most usual.

1. The kidney may be of a very dark-red, or brown colour, much loaded with blood, and its vessels very much enlarged. The tubular is always of a darker colour than the cortical part ; but the latter is in this case extremely dark-coloured. When it is divided by a longitudinal incision, the surface of the section is altogether much darker than natural, being a deep chocolate brown, while the cortical portion appears, though darker than natural, yet lighter coloured than the tubular, and presents the aspect of a brownish red mass, surrounding and enclosing dark-brown or amber-brown-coloured tubular cones. The outer surface of the gland, stripped of its tunic, is also very dark-coloured reddish brown, inclining to chocolate red, is less smooth than natural, and may even be a little rough and irregular, presenting small depressions containing blood-vessels in clusters ; and the gland is in general, in this variety and stage of the disorder, soft and flaccid. The whole gland is large, flabby, and very vascular.

This form of the disorder is seen chiefly in persons who have died from fever or pneumonia, or pleurisy, or in children with symptoms of affection of the brain.

2. In one variety next to be mentioned, the kidneys are large, soft, and flaccid ; and when the tunic is stripped, the exterior surface, though less deep in colour, is still more irregular than in the last mentioned variety. The colour, indeed, begins to assume a gray or fawn tint, the brown being less deep, and giving place to chestnut-brown or yellowish-brown. The irregular appearance on the surface is produced by numerous depressions, with alternate elevations. In the last case, the depressions are so few in number that they leave between them considerable smooth spaces of the outer surface of the kidney. But in this variety the spaces between the depressions are so small, and the depressions are so numerous, that the whole outer surface appears to consist of manifold alternate pits and eleva-

tions. These pits are remarkable for containing little clusters of red vessels. Sometimes, if the surface be attentively inspected by the eye, and always by the aid of the microscope, minute gray-coloured bodies like grains may be recognized deposited in the cortical substance, decidedly differing from the latter in the lighter colour which they present. Upon dividing such a kidney as this by a longitudinal section, the change in structure is still more conspicuous. The cortical portion has throughout become of a lighter colour than natural, and is generally some shade of orange, fawn, or yellow. Thus it may be buff-orange, which is a light stone colour, or reddish orange,—a salmon red tint, or deep reddish orange, or it may vary between these and honey-yellow, sienna yellow, or ochre-yellow. When inspected carefully, even by a good practised eye, and much more by the aid of a glass of moderate magnifying powers, this change in colour may be traced to innumerable little granular bodies, infiltrated, as it were, or deposited in the cortical substance, varying in size from the point to the head of a pin. The cortical or secreting matter of the kidney has then in general lost most of its peculiar striated arrangement; and presents the appearance of reddish orange, or honey yellow, or fawn-coloured matter, enclosing the tubular cones, and appearing as it were to encroach on their bounds and pass between them. The tubular cones, though retaining their colour, seem then rather smaller than usual, and appear like reddish oval-shaped bodies, enclosed, as it were, in the gray or orange-coloured cortical matter.

The extent to which this transformation proceeds varies in different kidneys, and in different portions of the same kidney. In some cases it commences in one of the extremities of the gland, and either extremity is then seen to be more remarkably changed than other parts. In other instances, it commences in the centre of the gland or rather the central part of the cortical matter; and then this part is most completely transformed.

In consequence of the peculiar change in the colour of the surface, the pits in which are of a darker colour than the elevations and intermediate portions, the kidney now described is said to be mottled.

3. Without increase in size or change in consistence, the cortical part of the kidney may be penetrated or infiltrated with granular albuminous matter in various modes and degrees.

a. In one variety, which appears to be comparatively in an early, though not an incipient stage, when the gland is stripped of its tunic, the surface is irregular, rough, or as it were sprinkled with fine sand, of a reddish gray colour, with more of the former than the latter, and part of the cortical matter not unusually comes off adhering to the tunic. The surface presents also small hollows or pits, containing blood-vessels as in the last variety; and, indeed, this appearance is one of the most constant. When the surface is closely inspected, numerous minute reddish gray granules may be recognized, not aggregated together, but separately infiltrated into the cortical matter. When the gland is divided by a longitudinal section, part of the striated texture of the cortical part is still recognized in the form of reddish-coloured streaks, extending from the circumference to the tubular cones; but all the rest of the cortical part of the kidney is of reddish gray colour, lighter than usual, and when minutely inspected, either by the eye or with the aid of a lens, small cream-coloured or grayish-coloured granular bodies are observed dispersed through the cortical matter.

In such a kidney as this, if coloured glue or isinglass be thrown into the blood-vessels, it does not perfectly, as in the healthy state, fill the cortical matter of the gland. The healthy parts only, or those which still retain the striated texture, are reddened by the injected size; while the diseased and gray-coloured portions receive little or none of the injected size.

In general, kidneys in this state are of the natural size, and, instead of being soft and flaccid, are either of normal consistence, or a little firmer than natural.

b. In a variety, which is perhaps in a more advanced stage of progress, the outer surface of the gland, if stripped of its capsule, is still more extensively marked with pits containing clusters of blood-vessels, so that the whole surface is irregular and vascular. These blood-vessels are star-like or asteroid, branch-like or ramiform, or in the shape of small dots and points, stigmatoid; and, according to the number, the size and the aggregation of these clusters, the external surface of the gland is red and vascular, or otherwise. Besides this vascular redness in pits and hollows of the surface, the whole gland is moulded as it were into irregular large hollows and elevations, so as to seem tuberculated or mammillated. Of the parts not vascular the colour is a sort of stone-gray or light reddish yellow, or

fawn-coloured, in considerable masses, so as to render the surface mottled or rather marbled.

A longitudinal section of a kidney in this state often shows a very complete change in the cortical texture. It presents little or no remains of striated matter; but the whole cortical portion is one uniform mass of yellowish gray, or buff-orange, or sienna-yellow or cream-yellow. In this case the new matter is not merely infiltrated, but it is so diffused that the cortical portion is transformed into it. A few tubular cones still remain more or less complete; but either they become transformed into the gray-coloured deposit, or the transformed cortical matter has so much encroached on them as to have diminished much their usual dimensions.

The shape of the kidney in this variety sometimes presents a singular deviation from the natural standard. The gland is tapered at each end, so as to present an apex more or less acuminate, instead of the usual rounded end of the gland. I am unable to say, whether this change in figure is congenital or the effect of the disease.

The cortical matter of the kidneys, so far transformed as in this variety, is almost altogether incapable of receiving injection.

4. In the next varieties, it may seem doubtful whether they are different from the last, or only the most advanced stages of the transformation and deposition.

The external surface of the kidney is of a slate-gray or leaden-gray colour, and presents, or may be said to consist of, numerous globular granules aggregated together. These globules vary in size from a small pin head to a millet seed, or the grains of sago, and are mostly of the sienna-yellow, or cream-yellow, or stone-gray colour, but in some parts they are of leaden-gray. Various patches also of the kidney present this leaden-gray tint, which may be traced partly to the intermediate spaces or lines, partly to the globular granules themselves. None of the striated texture of the cortical matter can be recognized in this variety, in which the cortical matter appears to be completely converted or transformed into the new formation. In the longitudinal section of this all that is seen is the appearance of a uniform mass of sienna-yellow animal matter, without trace of distinct organization, sometimes minute granular bodies, but almost never any striated texture.

The tubular cones retain a colour more or less bright red,

and, being enclosed in this buff-coloured morbid texture, present a striking contrast to the state of the healthy kidney. Sometimes they are diminished in size, and sometimes in the section made one or two of them seems either to have disappeared, while in the place which they should have occupied, buff-coloured matter is deposited, or to have been converted into a firm, solid, gray-coloured matter. This variety of change is also unsusceptible of injection.

The kidneys in this state are almost invariably firm and hard, and are sometimes smaller than usual.

5. It is very difficult, if not impracticable, to distinguish all the various forms of this buff-coloured or sienna-yellow transformation of the cortical matter of the kidney. Most of them differ chiefly in the shades of colour which the transformed cortical matter assumes, and the degree in which the striated matter has disappeared, and in which, consequently, the kidney has become incapable of receiving injection. The most usual colour in this stage, which is perhaps the concluding, is some shade of sienna-yellow, sometimes inclining to buff-orange, or to tile-red. In some rare cases the colour of the new deposit is lemon-yellow or gamboge-yellow. In others, it is of a tawny colour. In all these cases the kidney is in general small and firm, sometimes almost cartilaginous.

The kidney is liable to the same kind of change in the dropsy which follows scarlet fever. In some instances, the cortical portion is merely mottled or marbled, and its surface presents superficial hollows containing clusters of blood-vessels, while the section of the gland shows part of it changed in colour, though with remains of the striated texture. The change most usual in this class of cases is buff-orange, or tile-red; but in some instances it is so light as to be of a straw-colour or sienna-yellow.

6. In all the cases now mentioned, the transformation either affects chiefly, or is confined wholly, to the cortical matter of the gland. In a small proportion of cases, however, it either affects first and mostly the tubular portion of the kidney, or it affects that after previously affecting the cortical portion. In either case, it renders the tubular cones so affected very hard, almost cartilaginous, white or gray-white, or sienna-yellow. The nature of this change and its effects on the *tubuli* are not known. The *tubuli* are still pervious; but their tissue is pro-

bably thickened and indurated. The cortical matter is at the same time of a buff-colour, or tile-red, or sienna-yellow, but differing in shade from the colour of the tubular matter.

In some of these varieties of renal disorganization, the kidney externally is marked by fissures, so as to appear lobulated like the foetal kidney. It is uncertain whether this is the remains of the original foetal structure, or whether it is to be regarded as a return to the type of the foetal structure, as the effect of disease.

To complete the morbid anatomy of this disease it is necessary to advert to the state in which other organs are occasionally found.

The subcutaneous cellular membrane is in general more or less infiltrated with serous or sero-albuminous fluid.

The serous membranes often present marks of inflammation, as lymph, soft or firm, purulent fluid, masses of lymph, and adhesions between their free surfaces. In the subarachnoid tissue of the brain serous fluid is sometimes effused. But the parts most commonly presenting lymph or purulent fluid are the pleura and peritoneum. In other instances, sero-sanguine fluid alone is found in the cavities of these membranes. In one case only did I meet with lymph in the pericardium.

The bronchial membrane is often lined with puriform mucus, or muco-purulent matter streaked with blood; and the other appearances of chronic bronchial inflammation are manifest.

The intestinal mucous membrane is, in persons who have presented diarrhoea during life, rough, villous, and vascular; the follicles of Peyer are enlarged; more frequently the isolated follicles are enlarged, prominent, or ulcerated; and in some instances the isolated follicles of the colon are found the seat of ulceration.

In a certain proportion of cases, more than one-half, the heart is found hypertrophied; in one-fourth, the mitral valve ossified, and the aperture contracted.

In a smaller proportion of cases the liver is found enlarged, and its *acini* of a nutmeg colour.

The bladder is generally much shrunk, and contains a small quantity of urine, which when heated furnishes more or less coagulable matter, sometimes in considerable quantity.

The blood generally contains urea.

The period at which the change now described in the struc-

ture of the kidney commences varies under different circumstances. I have seen a partial and limited form of it affecting one portion of the cortical matter between the second and third years. One specimen I met with in a complete form affecting the whole cortical matter, with the buff-orange transformation, in a boy between six and seven years.

Of its rate of progress almost nothing is known. At first the change was observed mostly in the kidneys of adults; and in them there were few or no means of ascertaining the exact period at which the disease began. From various circumstances, however, which will appear in the history of the symptoms, it may be inferred, that it takes some time before it seriously impairs the functions of the gland, and that years may elapse from the first commencement of the disorder to the time when the change in structure is so considerable as to impede in a vital degree the function of the kidney.

II. PATHOLOGY.—Regarding the nature and origin of this change, various opinions are entertained. Dr Bright, who first directed attention to this change in the structure of the kidney, regards it as a species of degeneration; but thinks that there is in the kidneys in the early stage a process of slow inflammation, which lays the foundation of their future change in structure.* Dr Christison regards the granular degeneration, as it is usually found after death by long-continued bad health, with or without *anasarca*, as essentially a chronic disease; but allows that when the kidneys are dark-coloured, flabby, and enlarged, in connection with coagulable urine and eventual suppression, they may have been in the state of ordinary inflammation (*nephritis*).† It is also to be observed, that while several of the appearances found in the kidneys after death denote unusual congestion of the cortical matter, in the early stage the symptoms of pain and weight in the region of the loins, dryness of the skin, and thirst, indicate the presence of a febrile or inflammatory state of the system.

M. Martin Solon regards the disease as a hyperemic, that is, a congestive-inflammatory state of the kidneys, consequent on irritation of their vessels from the use of stimulating drinks; and to this hyperemic state he ascribes all the early symptoms, and the sero-albuminous state of the urine.‡ And even the

* Reports of Medical Cases, Vol. i. London, 1827, p. 72.

† On Granular Degeneration of the Kidneys, p. 10 and 11.

‡ De l'Albuminurie, &c. p. 258.

granular interstitial deposit, and the yellow degeneration, he considers as the effect or remote consequence of the previous hyperemic state, for this reason, that the marks of hyperemia are still found associated with the yellow degeneration. In some other passages of his work, however, he questions the necessary presence of inflammation in the disease.

M. Rayer, entertaining no doubt of the inflammatory nature of the disease, applies to it the name of *nephritis albuminosa*, and distinguishes it into two varieties, the acute and chronic. He is indeed the most decided and confident advocate for the inflammatory nature of the disease that has yet appeared; and his views have been espoused, explained, and defended by his pupil, M. Littré. The chief grounds on which M. Rayer maintains the inflammatory nature of the fawn-coloured degeneration of the kidney are, the vascular redness of the gland in the early stage of the distemper, the enlargement or swelling of the gland, the occasional presence of pain, and the general presence of feverishness; and at a later period the presence of vascular spots and patches, with the grayish or gray-yellow granular deposit. He is also of opinion, that the red points and spots seen in the substance of the kidney in the early stage of the distemper, (first form of M. Rayer,) in general correspond to the glandules of Malpighi, greatly injected with blood.

It seems scarcely possible to doubt, that, whether inflammation be the cause of the fawn-coloured transformation of the kidney or not, the process of inflammation is always present as an accompaniment. Two views, indeed, may be taken of the incipient agent or generating cause, and the nature of this disease. The first is, that inflammation of a particular form attacking the cortical portion of the kidney, may be the cause of all the subsequent changes. The second is, that the cortical portion of the kidney may be liable to an aberration of nutrition, in consequence of which its vessels deposit not the usual proper matter of the cortical portion, but a different substance altogether, chiefly in the form of albuminous or caseous matter in the interstices of the cortical tissue.

The first of these opinions, namely, that inflammation of a peculiar kind, most probably chronic, is the main cause of the several changes, is perhaps in a large proportion of cases true.

To the correctness of this conclusion it is not necessary that the change should terminate in suppuration. There may be, and we know that there are, different forms of the inflammatory process; and it is possible that the cortical or secreting portion of the kidney may be liable to a peculiar form of the inflammatory process, which may neither be sufficiently rapid to proceed speedily to the disorganization of the kidney, nor sufficiently violent to evince its presence by well-marked symptoms. That the process, whatever it may be, is chronic, may be inferred from two circumstances. The first is the fact, that the disease is often observed to have existed for months, or even years, without giving rise to any marked external symptom, excepting occasional diarrhœa, and sometimes attacks of rheumatic pain; and its existence is never suspected until some new symptom renders it requisite to examine the urine, which is then found to contain serous fluid. Rarely, indeed, do patients apply for assistance in the commencement of this distemper; and it is only when a train of long-continued bad health has prevailed for some time, or a smart attack of acute disease has come on, that the case becomes known in its true characters. The second circumstance, showing the disease to be most commonly chronic is, that when its true characters have become known by various unequivocal symptoms, it does not proceed very rapidly to the fatal termination. Some patients remain under the dropsical symptoms even for months, and eventually recover from them, though the primary disease may not be cured.

That the process is of the nature of vascular injection, afflux, and inflammation, seems to be highly probable, from the following circumstances. The appearances in the kidneys are analogous, if not similar to those which are found in other glandular organs when the seat of the congestive and inflammatory process. The dark-brown colour, the increased size, and the loaded state of the vascular system of the renal cortical matter in the early stage, are sufficiently indicative of a congestive state to justify the inference, that the cortical tissue is unduly loaded with blood, which, as in all congested and inflamed organs, moves at first slowly, next accumulates, and then stagnates in the vessels. In those stages, which may be placed after the very first, the vascular pits on the surface of the kidney, with the asteroid clusters of vessels, must be re-

garded as indicative of an inflammatory process. This inflammatory process, nevertheless, seems to be peculiar in this respect, that it causes absorption, or at least forms hollows in the cortical portion of the gland. The elevations may be either the result of this removal of cortical matter, the former being left as parts which have escaped the sorbefacient properties of the distemper, and indicating the previous level of the cortical matter; or they may be the consequence of a simultaneous process of deposition, or at least tumefaction.

In those stages of the disorder in which yellowish-gray or fawn-coloured granules are infiltrated as it were through the cortical substance, it seems quite consistent with correct pathology to ascribe this infiltration to the effect of the inflammatory process. One of the most constant effects of that process, if unchecked, is to give rise to morbid products of albuminous or tyromatous characters; and it seems perfectly reasonable to regard this deposit as the effect of the inflammatory process. But if it were possible to doubt the justice of this inference, it seems to be rendered certain by the co-existence of the vascular pits along with the granular infiltration.

In the aggregated slate-gray granular deposit, the same views are still more decidedly applicable. If the isolated granular infiltration be the effect of inflammatory action, *à fortiori*, the aggregated granular deposition is the effect of the same action. It appears as the final and extreme termination of that process, of which the others are earlier and immediate effects.

One of the strongest arguments in favour of the disease originating in congestion or inflammation is found in the fact, that it takes place after the application of various agents which act as remote causes of inflammation. Thus it often ensues as a sequela of scarlet fever, especially if the patient have been exposed to cold. In that disease, and for some time after the disappearance of the eruption, the action of the skin remains very feeble and languid; and the blood, which ought to circulate through the cutaneous vessels, is manifestly determined in excessive quantity to the kidneys and other internal organs. The quantity of blood thus thrown upon the different internal organs is greater than their vessels can readily transmit; these, consequently, become unduly loaded and distended; and hence inflammation and often discharges of blood take place at this period in convalescents from scarlet fever, and, among other in-

dications of this, the albuminous, and occasionally the colouring matter of the blood is forced through the kidneys, and is found in the urine.

The inflammatory character of this disease may be illustrated by considering the influence of another agent in its production. Nothing seems so certainly to be followed by the formation of granular disease of the kidney as the use of mercury in certain constitutions. In some instances, one single course of mercurial medicines has been known to be followed by the developement of the disorder; and in all cases in which repeated courses have been given, the disease is sooner or later observed to ensue. Now, it is to be observed, that the use of mercury not only induces an inflammatory state of the system, rendering the blood sily, and the individual liable to attacks of inflammation in various organs, but it also renders the urine serous.—(Wells, Medical and Chirurg. Trans. iii. p. 230.)

It is probable that the primary cause, nevertheless, is seated in disorder of the digestive organs. It is observed, that the use of various indigestible articles of food, as pastry, is followed by a serous state of the urine; and if a single meal of this kind be followed by such a result, it is easy to see that the frequent use of such articles will induce a habitual or constant serous state of the urine. It is manifest, however, that, as this state cannot be induced without more or less disorder in the vascular system of the kidney, the continued irritation may give rise to the change in structure which is eventually observed in the kidneys of persons who have become victims of this disease.

Another cause, which perhaps operates in the same mode, and also acts in unduly stimulating the kidney and its vessels, is the use of spirituous liquors. It is well ascertained that, among the subjects of this disorder, a considerable proportion are addicted to the habitual use of these pernicious stimulants, and, as they are often taken for their supposed diuretic properties, the delusion leads the patients to continue their use, until the disease acquires its confirmed and incurable stage. The truth of this conclusion is clearly established by the experience of Dr Bright in London, and the physicians of the Royal Infirmary in Edinburgh. In London, persons labouring under the symptoms of disease of the kidney are in general habitual drinkers of gin; and in Edinburgh, the habitual use of spirits is a circumstance not less common.

Exposure to cold is further a most powerful cause, both as predisponent and exciting. Exposure acts first on the skin as an agent in throwing the circulation in disproportionate quantity on the kidneys and other internal organs, and thus lays the foundation of congestion, which terminates in disorganization. After this has commenced and established the disease, a single exposure may, by inducing any of the secondary symptoms, render its presence manifest.

The second opinion, that the granular deposit is the effect of a peculiar aberration in nutrition, may be true without being inconsistent with the presence of the inflammatory process, either as a cause or as a concomitant. Every aberration in nutrition is preceded and accompanied with a considerable change in the circulation of the part; and whenever the aberration consists in the infiltration or deposition of new matter, the change in circulation is similar to, or the same with, inflammation. This is seen in the induration of other organs as the lungs, the brain, the liver, and the prostate gland. When, therefore, the granular disease of the kidney is called degeneration and transformation, it does not follow that the ideas thus conveyed exclude the presence of the inflammatory process.

III. SEMIOGRAPHY.—The effects and symptoms of fawn-coloured disease of the kidney are various, according to the stage and degree of the disorganization. From all the facts hitherto known, at first, and in the commencement of the disorder, they are so obscure that they often escape notice. In some instances, no conspicuous symptoms appear for a long time, until the cortical texture of the kidney is very much changed; in other instances, various symptoms of impaired health take place. The appetite becomes feeble; the tongue furred, or unusually red, dry, and glassy; the thirst becomes great, sometimes incessant; the skin dry and harsh; the extremities cold, and not easily rendered moist; the patient has sometimes dull pains or gnawing and weariness in the loins; and he has a greater number of calls to void urine than usual, especially during the night. At the same time, the face becomes pale and waxy; and the complexion acquires a peculiar white clear aspect, indicative of great delicacy or sickness, while the features become sharp and contracted. The urine is not always less in quantity than usual. It may be natural, that is, from 40 to 60 ounces daily, or it may be scanty. But it is found

when subjected to heat, between 160° and 212° , or on the addition of nitric acid, to become flocculent, or turbid, or even opaque, by the coagulation of serous fluid suspended in it. The urine is also, in general, of lower density than natural, being seldom higher than 1015, and more frequently rather below that.

These two circumstances, the presence of coagulable matter, and a degree of density lower than natural, are the characteristic symptoms of the presence of the fawn-coloured degeneration of the kidney in different degrees and stages.

The degree of coagulability, or, to speak more correctly, the proportion of serous fluid varies. Dr Wells found by various comparative experiments on healthy urine, and urine to which he had added known quantities of serum, that when serum exists in urine to the proportion of 1 to 640, there is formed by heat, a coagulum resembling a fine powder, which, if equally spread over the bottom of the vessel or phial, barely conceals it from sight; and that, in other proportions, degrees of coagulability ensue, which are represented by the following numbers.

1-320th of serum gives a coagulum of 1-20th.

1-160th 1-8th.

1-80th 1-5th.

1-40th 2-5ths.

1-30th $\frac{1}{2}$.

1-25th 3-5ths.

1-20th 3-4ths.

1-15th 4-5ths.

1-10th 7-8ths.

In all the proportions except the last, small incoherent shreds of coagulum are formed. When the serum amounts to 1-10th, or the coagulum to 7-8ths, the mixture shows a disposition to form large masses of soft jelly. When the serum is 1-8th of the mixture, the whole is converted into a semifluid jelly. If it amounts to 1-7th, the jelly is firmer, and begins to adhere to the phial; if 1-6th, a great part adheres to the phial; and 1-5th, the whole mixture becomes in general one solid mass, which adheres to the phial even when inverted.

If it be wished to designate the degrees of coagulability by appropriate and convenient terms, it may be done in the following manner. The lowest is when the urine is merely rendered opalescent by heat; the next, flocculent; the next, tur-

bid and flocculent ; then coagulable, moderately coagulable, and highly coagulable.

It has been doubted by several authors whether the connection between the serous state of the urine and the disease of the kidney is so constant as it is represented by Dr Bright ; and it has been maintained on the one hand, that the urine may be coagulable without the presence of the granular disease, and on the other, that the kidneys are found diseased without the presence of serum in the urine.

On the first point it may be admitted, that the urine is sometimes found coagulable, while the kidneys are not so much diseased as to preclude recovery. This merely shows, that the disease has a beginning, during which the urine may present temporary coagulability ; or, that the urine is liable to become serous under certain circumstances of temporary operation. But it does not warrant the inference, that when the urine is coagulable, there is no disease of the kidney. The disorder may be dynamic, that is confined to the function of the gland, while the structure of the gland is still entire. It is indeed most probable, that in the early stage of the disorder, and in certain slight and transitory forms of derangement in the circulation of the gland, the urine is serous only occasionally, and for a short time, and either under proper treatment, or the restorative power of the skin and its circulation, the urine may return to its healthy state. This I have myself seen take place several times both in the serous state of the urine, and dropsical effusion ensuing on scarlet fever, and in the early stage of renal disease. So far as any inference can be confirmed by numerous well-authenticated facts, this may be allowed to be well-established, that the continued serous state of the urine does not take place without more or less disease in the cortical portion of the kidney.

It has been imagined, however, that the serous state of the urine is in the exact ratio of the amount of disease of the kidney ; that is, that the more copious the serum in the urine is, the more complete, and the more advanced is the disease of the kidney. This is not exactly true. At the first and commencing stage of the disorder, certainly the urine is in general less serous than afterwards, when the change in the kidney is probably either more general or more complete, or when the inflammatory congestion, is more thoroughly developed ; and in

many instances of the first appearances of the disorder, it is not constantly serous, but may be so for several days, and then return to its natural state. As the disease proceeds, however, the urine becomes more loaded with serum, and is constantly found at every trial to contain matter coagulable by heat, and the addition of nitric acid. At more advanced stages in progress, especially if there be much anasarca, the proportion of serous fluid in the urine sensibly diminishes, though it does not disappear; and in this class of cases, the diminution of coagulable matter is in general the precursor of the fatal termination. This diminution I have seen take place not only when there was fawn-coloured deposit in the kidneys, but when the disease was in the inflammatory, and therefore in the early stage, when the outer surface of the cortical portion was traversed by manifold vascular hollows, and the fawn-coloured matter was only infiltrated into the cortical substance.

In other instances in which the external symptoms of the disease, for instance, anasarca, are suddenly induced after exposure to cold, there are not the same opportunities of tracing the first appearances, and the progressive increase of the albuminous impregnation. The urine is, when first examined, more or less albuminous, sometimes very considerably so; and this continues steadily until some impression is made on the disorder by remedies, or until the disease is approaching to the fatal termination, when, as already observed, the urine becomes sensibly less serous, or may, for a time, be altogether free from albuminous matter.

It must not be inferred, nevertheless, that, in all cases, a diminished degree of coagulability in the urine indicates deterioration and the tendency of the disease to the fatal event. In the ordinary run of cases, the diminished coagulability, if attended with corresponding changes in other symptoms presently to be mentioned, is a proof of a tendency to recovery, and may, in these circumstances, be regarded as a symptom of convalescence.

In one class of cases the coagulability of the urine is distinct, and considerable to the last; viz. in those in which there are symptoms of disorder of the brain and its membranes, as stupor, coma, apoplexy, or epilepsy.

With the presence of serous or albuminous fluid in the urine another change is observed to take place in that fluid. Its den-

sity or specific gravity is diminished. The density of healthy urine ranges from 1015 to 1033; and the average, as determined from the examination of the urine in fifty instances of persons in good health, is, at the highest, 1.026, and at the lowest 1017, water being as 1.000. The general average, therefore, amounts to 1022. If it be stated between 1022 and 1026, it cannot be far wrong. This is understood while the quantity discharged daily is from 45 to 53 ounces, which is about the general average in healthy individuals who consume liquids at the ordinary rate. When the urine is charged with serum in consequence of disease of the kidney, its density falls to 1020, 1017, 1013, 1010, and sometimes so low as 1006. Dr Bostock found the average density of the urine in nineteen of the cases published by Dr Bright to be 1017. Dr J. C. Gregory found the average density in fifty cases of persons affected by symptoms of disease of the kidney to be 1013.18; in twenty-five fatal cases of which it was 1011.88; and in twenty-five terminating favourably or relieved it was 1014.48. In most of the cases examined by myself, the density has varied from 1008 to 1011. It may be stated as a general result, that, whenever the urine descends much below 1016, it is specifically lighter than it ought to be.

The diminished density is, in general, proportional to the degree of coagulability or the amount of serum in the urine. But even this does not hold invariably correct. In two cases given by Dr Gregory, in which it was very strongly coagulable, the density amounted to 1020 and 1022; and in one case, in which it was strongly coagulable, it amounted to 1023.

In general, the density is, *caeteris paribus*, highest where the quantity of urine voided is scanty.

The great use of this knowledge of the low density in coagulable urine consists in this, that, while the coagulability alone does not positively indicate the presence of renal inflammation or disorganization, yet, taken with diminished density and observed to be permanent, it indicates, with great certainty, the presence of more or less disease of the kidney.

One of the principal causes of this lowered density of the urine depends on the diminution of the solid contents of the urine. Less saline matter and less urea, or the characteristic principal of urine, is discharged by the kidneys than in the healthy state; and as it is principally on the presence of these

principles that the density of urine above that of pure water depends, their absence necessarily reduces the density of the fluid discharged by the kidneys.

This diminished amount of the characteristic principle of the urine in renal disease has suggested the idea, that the presence of albumen is vicarious of, or substituted for that of the lacking urea. This inference, however, though favoured by some authors, is contradicted by two circumstances. The first is, that it is ascertained by the best observers on this point, Dr Bostock and Dr Christison, that the increase of the albumen is not in the inverse ratio of the diminution of the urea, but that where the proportion of albumen is small, that of the urea and saline matter is also small, and where the proportion of albumen is considerable, that of the urea may also be considerable. The second is, that though under the use of treatment, and sometimes spontaneously, the albuminous matter may be greatly diminished, or may wholly disappear for a time, yet the proportion of urea does not reappear in the urine.

It is also to be observed, that though the kidney be much diseased, urea is found in the blood in this state of the system. Dr Bostock found in the serum an animal matter possessing peculiar properties, which approached to those of urea; Dr Prout also found in a specimen of urea taken from a patient with coagulable urine and partial suppression, a substance analogous to urea; and Dr Christison afterwards recognized and demonstrated the presence of this principle in repeated instances of the distemper. Urea, according to the last observer, is invariably found in the serum at all stages of the disease, while the daily discharge of it by the kidneys is diminished to about one-third of the natural amount.

The sensible qualities of the urine are more or less impaired. Instead of the orange or citron-yellow colour of healthy urine it is brown, straw-coloured, or of a reddish tint; or it is pale and almost colourless. It is brown when it is scanty; when reddish it usually contains the colouring matter of the blood; and it is pale and almost colourless, when it is abundant and coagulable. It is of a watery pale aspect when recovery is beginning to take place. In the dropsical affection ensuing after scarlet fever, the urine is usually scanty, brown-coloured, and deposits a sediment, which is soluble in nitric acid, while at the same time albuminous matter is shown to be present.

It afterwards becomes clearer ; but often it presents the red colouring matter of the blood lying at the bottom of the vessel. Eventually this disappears, leaving the urine, however, coagulable and at the same time clear, pale, and almost colourless.

The state of the blood, is not less important in several respects than that of the urine.

α. In the early stage of the disorder, and even after the disease has continued some time, the blood drawn presents when coagulated a thick firm buffy coat, generally much cupped. These characters are as strongly and distinctly marked as in the most acute inflammatory disorders, as rheumatism, pleurisy, and pneumonia ; and they are as strongly marked when the disease is simple, and by itself as when it is complicated with, or has given rise to any local inflammation. With the thick firm, and the strongly cupped buffy coat, the serum is in general abundant, that is about half the amount of the blood drawn. The serum is sometimes observed to be more or less opaque, opalescent, or actually milky ; and so commonly have I met with it in this state, that in several cases I have been led to expect, before examining the urine, that this fluid would be found coagulable, merely from the circumstance of the opalescent or milky state of the serum. This milky state was shown by Dr Christison to depend on the presence of oily matter, which is mixed like an emulsion with the serum, and from which it may be detached by agitating the serum with sulphuric ether. It is then found to be quite similar to the fat of the adipose membrane.

β. The serum is also much less dense than usual. The natural density of this fluid is from 1029 to 1031. In disease of the kidneys it falls much below this. Dr Bostock found it so low as 1.013, nearly the same with that of the urine. In general it is not higher than 1022, and it may be so low as 1019. The solid contents are at the same time diminished, being reduced from 100 or 102 per 1000, to 68, 64, or 61. The serum in this state forms a loose coagulum when heated.

The density of the serum is increased in the advanced stage, when the urine becomes less coagulable.

The presence of urea in the serum has been already mentioned.

In the other constituents of the blood changes not less considerable take place.

γ. The proportion of fibrin is usually increased in the early

stage. The proportion of fibrin in healthy human blood varies according to the analysis of Lecanu, from 21 to 35 in 10,000 parts, according to Dr Christison from 25 to 52 in 10,000 parts. In the early stage of disease of the kidneys, it may be either very high or rather lower than natural. The extremes given by Dr Christison are 82 per 10,000 as the highest, and 30 per 10,000 for the lowest. These variations depend, there is reason to believe, on the presence or the absence of inflammatory action.

δ. The proportion of hæmosin or colouring matter is little affected in the early stage of the disorder; but as the disease advances, its proportional amount to the other ingredients undergoes progressive, but steady diminution, until it forms less than one-third of the average amount in health. This reduction in the amount of the hæmosin is greater in this than in any other distemper; and though it is liable to be confounded with the effects of blood-letting and similar remedies, yet all the facts of the disease show that this is one of the most constant and uniform effects of the disorder of the kidneys.

This change in the constitution of the blood is so much the more remarkable, that it tends to explain, if not fully, at least in a great degree, the peculiar pale waxy complexion, which is one of the most uniform external symptoms of the distemper, both before and after the supervention of dropsical infiltration. This clear pale waxy colour, sometimes with a degree of transparency of the skin from incipient anasarca, is so characteristic that it is often possible for the practised eye to recognize patients labouring under this disorder by this symptom alone.

The other symptoms of this disorder which may be regarded as secondary effects, and which some consider as secondary diseases, may be enumerated in the following order, which is to be considered as representing as accurately, as is practicable, the degree of frequency in which each takes place. These are dropsy or anasarca, usually with effusion into the belly (*ascites*,) and chest (*hydropleura*;) diarrhoea; catarrh, pneumonia and pleurisy; peritonitis; vomiting, and various dyspeptic symptoms; stupor or coma, apoplectic or epileptic symptoms; chronic rheumatic pains; affections of the heart; and diseases of the liver.

A. Anasarca or general dropsy of the skin and cellular membrane, is the most usual of all the symptoms or secondary effects of disease of the kidney.

The name *anasarca* is applied to a swelling of the surface of the body, at first appearing in particular parts only, afterwards spreading over the whole. So far as it extends, it is a uniform swelling over the whole member at first, always soft, and readily receiving the pressure of the finger, which leaves a pit or hollow for some little time after the pressure is removed, but at length rises again to its former level. This swelling (*œdema*) generally appears, first upon the lower extremities, and there only in the evening, disappearing again in the morning, when the face and especially the eyelids may be observed to be œdematous. It is usually more considerable as the person has been more in the erect posture during the day; but there are many instances of the exercise of walking, preventing altogether its usual accession. Though this swelling appears at first only upon the feet and about the ankles, yet, if the causes producing it continue to act, it gradually extends upwards, occupying the legs, thighs, and trunk of the body, and sometimes even the head. The swelling of the lower extremities commonly diminishes during the night; and in the morning the swelling of the face is most considerable, which again disappears almost entirely during the day.

Anasarca evidently consists in a preternatural collection of serous fluid in the cellular texture immediately under the skin. Sometimes penetrating the corion, it oozes out through the pores of the cuticle;—or too gross to pass by these it raises the cuticle in blisters. Sometimes the skin, not allowing the water to penetrate it, is compressed and hardened, and at the same time so much distended, as to give anasarcaous tumours an universal firmness, when they are very liable to be affected with erythematic inflammation. This hard skin-bound state of the extremities is common in disease of the kidney in robust young persons, and in those in the early period of life.

The exciting causes of *anasarca* are the same as the remote causes of inflammatory diseases in general. It commonly appears after obvious exposure to cold applied either externally, or internally by drinking copiously of cold water, when overheated; it is a very common consequence of scarlet fever; and it may appear after continued fever, hemorrhage, or any other acute disease. It may appear either alone, or in combination with dropsical effusion into the serous cavities, and even into the cellular tissue of the internal organs. Cullen had occasion

to conclude that the water of anasarca swellings is more readily communicated to the lungs and *pleura*, than to the cavity of the belly, or the viscera contained in it; and the remark has been confirmed by Blackall and most subsequent authorities. In some instances a translation appears to take place. Thus the anasarca swelling diminishes, while symptoms of water in the brain or chest come on, or the belly becomes enlarged with fluctuation. In other instances, the anasarca swelling remaining the same, water is deposited within the brain, in the lungs, *pleura* and *pericardium*, in the peritoneal cavity, and in every interstice of the body, constituting the most extensive form of disease, general dropsy. These phenomena are to be explained not only by the general and extensive distribution of the cellular membrane, but especially by the vessels of all these parts assuming the same mode of action, and, above all, by the disease of the kidney operating generally through the frame.

When anasarca comes on as an effect of disease of the kidney, it may appear either suddenly or slowly. Its sudden appearance is most common after exposure to cold, either dry or with moisture. Thus sleeping on the ground or on the floor, or in a damp apartment, or getting thoroughly wetted, have all been observed to be followed in persons with coagulable urine, by the sudden appearance of anasarca swelling all over the body. It is then often associated with symptoms of *bronchitis* or *pneumonia* of a very urgent character, and sometimes with distinct fluctuation in the abdomen, and indications of peritonitis. In cases of this class, the *labia* and *nymphæ* in females swell early, and attain a great and inconvenient size; and in like manner the scrotum and prepuce in males become distended with serous fluid. When œdema disappears from the extremities, and fluid from the belly, these swellings of the *labia* and scrotum often remain for some time.

When the swelling is slower and more gradual in its approach, the feet and ankles are first observed to be swelled; the skin is rough and harsh; and sometimes the cutaneous papillæ are red and injected like petechial spots, or the skin becomes variegated with red patches like those of *erythema fugax*, or nettle-rash wheals. In general this swelling is worst at night, and disappears towards morning. At length the legs and thighs become affected with solid firm œdema, which does

not readily receive the impression of the finger; and the abdomen and trunk in general present the same phenomenon.

Effusion into one or both cavities of the chest (*Hydropleura symptomatica*) is also not an uncommon consequence of disease of the kidney and an accompaniment of anasarca. It takes place in two modes. Either it appears along with the anasarca as a simultaneous effect of disease of the kidney; or it comes on in consequence of, and during the presence of pneumonia induced at the same time. Its presence is indicated by breathlessness, orthopnoea, palpitation, dulness on percussion at the lower and convex parts of the chest, and obliteration of the respiratory murmur in the same region, very often with the crepitous rattle of pneumonia a little higher up; *e. g.* in the region of the lower angle of the scapula.

In other instances distinct pleurisy takes place and proceeds to the effusion of lymph and purulent matter, the presence of which is known by its characteristic symptoms.

The most usual, perhaps, of the internal effusions in disease of the kidney is *ascites*, that is, effusion of serous fluid within the cavity of the peritoneum. At least it is almost invariably observed in every case of anasarca from disease of the kidney.

The effusion begins with general swelling over the belly, which, however, is most considerable at the epigastrium and navel. As it advances, the swelling becomes uniform over the whole belly, when, by reason of the tension, it assumes the appearance of a distended bladder (*ασκος*), and hence the name *ασκητιση*. At the same time, the superficial veins become large and prominent; and in some cases the skin at the navel is protruded, while the umbilical orifice is reopened. The distension and sense of weight, though considerable, vary according to the posture of the body; the weight being felt most on the side on which the patient lies, while on the opposite side the distension is less.

In all instances of abdominal dropsy, the belly, especially the hypomphalic region, emits a dull sound on percussion, especially in the sitting posture, while the epigastric region emits a clearer sound. In the sitting posture also, and sometimes in the lying, it is possible to distinguish the fluctuation of fluid either by palpation, or by tapping with the fingers gently on the one side of the belly, while the fingers of the opposite hand are kept applied to the opposite side. The impulse of fluid is

then felt; and it is also sometimes heard by the ear. By this means renal *ascites* may be distinguished from tympanites, from hepatic *ascites* by the absence of tension in the hypochondriac region, and by the presence of coagulable urine, from solid enlargement of any of the abdominal organs (*physconia*), and from pregnancy in females.

It happens in young robust men, however, and both in males and females before the decline of life, that the abdominal integuments may be affected with hard firm œdema; and it is then extremely difficult to procure the symptom of distinct fluctuation. In this difficulty, the other symptoms derived from the state of the urine will prevent mistake.

The fluid in renal ascites is sero-sanguine, with large quantities of coagulable lymph. In some instances where it is removed by tapping, it contains so much coagulable matter, that it coagulates spontaneously into a firm jelly. This took place in a case seen by Mr Watson and myself, and in which that gentleman performed the operation of *paracentesis*. After death, which followed some months afterwards, the mottled and otherwise morbid state of the kidney was ascertained. (Case of the woman Dewar given by Dr Christison.)

Its colour is generally brownish, perhaps from admixture of blood. Sometimes it is greenish yellow. In other instances, it is of a chocolate or coffee colour. As to consistence it may be thick and ropy, like diluted treacle.

It does not necessarily follow, that, because the skin is œdematous, and even the serous cavities more or less filled with serous fluid, the urine should therefore be scanty. It may be natural in point of amount, or even greater than natural, when it is pale, serous, and low in density, in this variety of anasarca.

Anasarca and dropsy, though very frequent, are not necessarily effects of renal disease. They take place chiefly after the disease has continued long, and especially where the individual has been freely exposed to cold. They may, in like manner, disappear without the primary disease being much ameliorated. The circumstances on which the occurrence of dropsy depends are otherwise unknown. It is probable, nevertheless, that the tendency which renal disease evinces to attenuate the blood may contribute to the dropsical infiltration.

B. Another very common effect of renal disease is a degree of irritation of the stomach indicated by various dyspeptic

symptoms, but especially by frequent and uncontrollable vomiting.

At first the appetite of the patient is impaired ; the tongue is covered with a whitish viscid fur ; the patient is thirsty ; he has disagreeable eructations ; and his usual food lies heavy on the stomach. Then vomiting of certain articles takes place, and may subside. But in no long time it returns and becomes obstinate, the patient rejecting everything taken. In other instances the appetite is not impaired, and the patient either desires food or thinks he can take it ; yet when taken, it is more or less speedily rejected. The stomach may even be so irritable that retching and vomiting, or the former alone, are incessant.

The period at which this symptom takes place, and the circumstances under which it takes place, vary. In my own experience, it has most usually taken place in cases in which no dropsical effusion had as yet appeared. At the same time, it does take place after the appearance of anasarca ; and then it is, in general, an indication of the near approach of the fatal event.

Retching and vomiting in this disorder are not constantly or even generally attended with pain, soreness, or tenderness in the epigastric region. When the tongue is furred, however, and the thirst considerable, more or less wasting takes place. The features are shrunk and contracted ; the complexion becomes pale and waxy, or even cadaverous ; and the strength is much impaired.

The occurrence of vomiting in diseases of the kidney is not easily explained. It cannot be regarded as a symptom of gastric or duodenal inflammation. Is it to be regarded as dependent on the nervous irritation reflected from the renal plexus to the gastric branches of the great sympathetic, or does it arise from the irritation caused by the presence of urea in the blood ? It is an unfavourable symptom, and though it is susceptible of relief, it rarely disappears wholly.

C. Habitual diarrhœa, or frequent attacks of looseness, are also a common symptomatic effect of granular disease of the kidneys. Of this symptom, two varieties may be distinguished.

One seems to be inordinate irritation of the intestinal mucous membrane, especially the follicles, which is remarkably evinced on exposure to cold and the use of various articles of

food. This symptom comes on and ceases at intervals for months or even years before it threatens to be permanent and serious. It is then alleviated by warmth, opiates, antacids, as chalk mixture, cordials, and proper food; and in some instances it seems, after continuing for twenty or twenty-four hours, to remove its own cause of irritation, and then subside spontaneously. After recurring several times, however, it is liable to become habitual; and then, in all probability, it passes to the variety to be noticed next.

In this variety there is reason to believe that irritation of the intestinal villous membrane and follicles has proceeded to inflammation and ulceration. The attacks of looseness are not only frequent, but become at length habitual, so that the strength of the patient is worn down by an enfeebling and exhausting discharge. In the cases in which I have had opportunities of examining the intestinal canal, after this disease had subsisted for some time, the following were the most usual appearances. The mucous membrane of the ileum was rough and irregular; the isolated follicles were elevated and reddened, and sometimes ulcerated, when they were in general pale; the aggregated follicular patches were raised, rough, prominent, and in some parts abraded; and the whole mucous membrane seemed covered with stringy filaments. The follicles of the colon were in some instances enlarged; and in some they formed multiplied small ulcers.

Habitual diarrhœa is often a precursor of the fatal termination, and is most common, perhaps, in the advanced stages of the disorder.

D. Inflammatory disorders of the tissues composing the lungs are very common among the labouring classes, who are most exposed to the exciting causes of the disease. The majority of patients admitted into the Royal Infirmary of Edinburgh for symptoms of granular disease of the kidney, apply either for dropsy alone, or for symptoms of bronchitis, pneumonia, or pleurisy, or for dropsy with pneumonic or pleuripneumonic symptoms. In my own hospital practice I have seen few cases, indeed, where more or less anasarca was not associated with bronchitic, pneumonic, or pleuritic symptoms. In private practice, on the other hand, the disease more frequently indicates its presence by fits of vomiting or diarrhœa, or by symptoms of affection of the brain.

Of pulmonary affections the most common is certainly chronic *bronchitis*, often with copious puriform expectoration. The frequency of this secondary effect has been already noticed by Dr Blackall. (Chapter XIII. Section II. p. 214.)

Next to this is pneumonia, either with or without pleurisy; occasionally hæmoptysis takes place, and when it does, is found to be connected with an engorged and indurated portion of lung. Last of all comes pleurisy, which may be acute, but generally proceeds to the effusion of purulent matter within the cavity of the pleura.

Tubercular destruction of the lungs, which is observed in a small proportion of cases, is to be regarded, perhaps, rather as a complication than an effect of the disorder. I have seen not more than two cases in rather more than eighty instances of disease of the kidney; one in a young boy within the last three months.

E. Another effect of granular degeneration of the kidneys consists in irritation and afterwards oppression of the functions of the brain, indicated by stupor, lethargy, epileptic symptoms, apoplectic symptoms, or coma.

The mode of approach of these symptoms is various. Patients labouring under granular disease of the kidneys are liable to suffer from pain in various parts of the head; and in general, if pain be felt in the frontal region or in the temples for some days, it should be contemplated with apprehension. In some cases, however, instead of pain, or without that feeling, giddiness, confusion, and a sense of weight take place; and the patient not unfrequently speaks a little incoherently, showing that memory is impaired or confused. These symptoms are followed by drowsiness (*somnolentia*), from which the patient may still be roused; and in the wakeful intervals he swallows and takes food and drink. This is more or less speedily converted into lethargy, stupor, and at length coma so profound, that no effort can rouse the patient.

In this state the pupils are contracted; the eyes are turned upwards, so that when the eyelids are opened the white conjunctiva alone, a little suffused, is seen; the eyelids are closed; and the forehead is often knitted. The respiration also is performed in a peculiar slow and feeble manner, the motions of the chest being sometimes not more than eight or ten in the minute, and in some instances so unfrequent as five or six in

the minute, with long intervals of rest. Commonly in this state the urinary secretion is altogether suppressed, and the surface of the body exhales a urinous odour.

In other cases, less numerous certainly, the patient is suddenly attacked with insensibility and epileptic convulsions, which too frequently pass into coma or apoplexy. The urine is suppressed, and the extremities are often cold to the last.

These symptoms have been ascribed by Dr Osborne to a low form of *arachnitis*. But for this notion there seems to be in the majority of cases very slender ground. In some cases of dropsy after scarlet fever, or even of affection of the head after that disease, there may be more or less meningeal irritation and inflammation. But this view does not apply to the majority of cases of adults destroyed by this form of the disorder.

In persons destroyed under the symptoms now mentioned, the appearances found after death in the head are by no means similar or uniform. In several cases a little serous fluid is found within the ventricles, and also in the subarachnoid tissue. The vessels neither of the cerebral membranes nor of the brain itself are much congested, certainly not more than in the bodies of persons who have not died comatose. Sometimes the brain is mottled as it were with bloody spots, especially in cases of apoplectic or epileptic attacks. But conversely it is also found bloodless. In some cases terminating fatally by convulsions and coma, blood has been found effused between the *dura mater* and arachnoid membrane. In some instances the membranes have been found loaded with blood as in meningeal apoplexy, and the convoluted surface of the brain reddened, and, as it were, sanded with blood.

F. Rheumatic pains are in several cases of the disease of the kidney urgent and frequent. They are mostly chronic or semi-acute. They may affect various regions; but are most common in the extremities, especially the lower. It is difficult to say whether pains in the loins and back belong to this head, or are to be regarded as indicative of the inflammatory state of the kidneys.

G. In various cases of disease of the kidney, patients present symptoms of different lesions of the heart. The most common is more or less hypertrophy, and this seems to be so frequent in London, that, among 100 cases, the heart was in a state of

hypertrophy in 52; and among 34 of these the valves were found in a normal state. This is a larger proportion of instances of hypertrophy than is usually observed in the cases of granular kidney taking place in this city. This tendency to hypertrophy Dr Bright ascribes to the irritation applied to the organ by the change in the constitution of the blood, or to the efforts to which it is roused, in order to impel the blood through the distant divisions of the vascular system.

In most of the cases observed by Dr Bright, the hypertrophy kept pace with the lesion in the kidney, so that where the latter gave indications of having been long diseased, *e. g.* in great hardness and contraction, the former also was in that state of hypertrophy which showed that its deranged action had been long continued.

H. The liver is sometimes affected with different forms and degrees of disorder; but they seem as much to be entitled to the character of complications, or conjunct effects of the same general causes. At the same time this gland is less frequently affected than might be presumed, considering the nature of the alleged exciting causes of the disease. Among 100 cases, Dr Bright found the liver free from disease in 40, and in other 32 no other indications of disease except the dark brown coloration of the acini, which is the usual attendant of impeded circulation through the lungs, and which, indeed, seems to be produced by inordinate venous congestion. The instances of confirmed disorder in the structure of the liver did not amount to more than 18.

The statements now given will enable the practitioner in general to detect the presence of this disease. But as many are incredulous, and as it is sometimes difficult to persuade practitioners that, in cases of bad or declining health with vomiting or diarrhoea, stupor, or convulsions, or apoplectic coma, these phenomena are dependent on lesion, not of the stomach, or intestines, or brain, but on lesion of the kidney, it may be proper to add the following remarks.

In all cases of pale waxy complexion or slight puffiness about the eyelids, or vomiting, or diarrhoea becoming habitual, and when the symptoms show no direct lesion of the stomach, and in cases of sudden attacks of drowsiness, or stupor, or epileptic symptoms, the urine ought to be immediately examined, and the

attention of the practitioner directed to its density, its coagulability, and other qualities.

ETIOLOGY.—On this subject all that is well known has been already anticipated. When the influence of mercury and mercurial courses, the habitual use of spirits, intemperance generally, exposure to cold, and the effects of scarlet fever, are mentioned, everything is stated almost that is known. From the fact of the disease taking place, nevertheless, in young persons who have neither been much subjected to the use of mercurial medicines, nor been addicted to the use of spirits in any form or degree, there is reason to think that its formation may depend on some original disposition; and of this disposition, the unknown and undefined abstraction, the strumous diathesis presents itself as a convenient if not assured essence.

THERAPEUTICS.—One of the great uses of the important generalization of Dr Bright is, that it enables us to specify and understand in a more precise manner than heretofore, the therapeutic principles by which the practitioner should be guided in attempting the treatment of this disease. When the disorder was considered as dropsy, the great object was to act on the kidneys by the exhibition of various diuretics; and sometimes recoveries took place, more frequently the disease proceeded to the fatal termination. Dr Blackall, by showing that when the urine was albuminous, there were in general symptoms of the inflammatory diathesis and the marks of local inflammation, effected a great improvement in the mode of treatment and in the selection of diuretic remedies. The information since that time collected by Dr Bright, Dr Christison, Dr Gregory, and Dr Osborne, if it have not always made the disease more curable, has at least rendered the treatment more rational, more precise, more simple, and less fluctuating.

Presuming the views already given on the nature of the disorder, and its tendency and effects to be well-founded, it results that it ought to be treated in the commencement as an inflammatory complaint; and hence antiphlogistic measures are requisite, not only to abate and remove the congestion of the kidneys, and arrest, if possible, the deposit of granular albumen, but also, as the best means of counteracting and removing most of the secondary symptomatic disorders; not only also in the commencement but in the course of the disorder.

The history of the disease already given shows also that, in establishing therapeutic principles, two distinct objects ought to be kept in view. The first is to employ the remedies calculated to act on the organs primarily affected; the second is to employ remedies required to remove particular secondary disorders and symptoms, and in so doing, to avoid as much as possible remedies which are contraindicated by the primary disease.

These points being premised, I proceed to say, that not only the primary disease, but several of the secondary affections, require the employment of remedies, which act on the sanguiferous system in general and on that of the kidneys in particular. Of these the most powerful are blood-letting, general and local. Next to these, remedies which act on the circulation and secretion of the alimentary canal, viz. cathartics and ecoprotics, are indicated. In the third place, it is of the utmost moment to restore the functions of the skin to its natural state, by means of diaphoretics. In the fourth place, it is requisite, in a great majority of cases, to attempt the removal of the dropsical symptoms, by means of diuretic medicines. And lastly, it is sometimes requisite to palliate various symptoms, as vomiting, diarrhœa, &c. though the remedies required for these purposes may be opposed in action to the general objects of treatment.

1. *Antiphlogistic Remedies.*—These consist in blood-letting, general and local, low diet, rest, and the use of laxatives and diaphoretics.

Of all these several means blood-letting undoubtedly claims the first place. It is indicated more especially when the pulse is quicker than natural, and hard or full; when the breathing is short, frequent, laborious, and panting; when the skin is dry and the thirst great; and in order to its operating favourably, it ought not to be less than 18 or 20 ounces for an adult, and if 25 or 30 can be taken, it will still be more efficacious. Its effect is in general to diminish sensibly the watery swellings, abate the thirst, remove local pain or tightness, and increase the flow of urine. The effect of general bleeding may be augmented by the application of leeches, or by cupping and scarifying; and these means will be most expedient when the swellings are on the decline, and when the urgent symptoms have been removed by copious general evacuation.

This method with blistering is well adapted for the removal of local pain. On this point the evidence of Parry, of Blackall, and especially of Dr Crampton in his Clinical Report, is quite conclusive. "Whenever the organs of respiration appear to labour, if the strength is not much impaired, and the disease is recent, it will be safe to practise general bleeding; still more so, if in addition there are symptoms which denote inflammation of any texture in the cavity of the thorax." And of its powers in abdominal dropsy, he justly says, "there is no form in which detractions of blood are more useful than those in which the peritoneum is inflamed, and where ascites follows."

But blood-letting must often be carried to a much greater length, in order to remove the urgent symptoms, and give the patient a reasonable chance of recovery. Whenever anasarca is attended with bronchitic, pneumonic, or pleuritic symptoms, blood should be drawn to the extent of 30 or 35 ounces at once, and may be carried by repetition to the amount of 80, 90, or 100 ounces in the course of 60 or 72 hours. In cases of this description a safe guide to which to trust, is the breathlessness and orthopnoea as well as the anasarca. So long as the patient cannot breathe in the horizontal position, and so long as there is much swelling of the face, belly, and limbs, blood-letting ought to be continued, if not daily, at least twice a week, according to the urgency of the symptoms and the strength of the patient.

The cases in which not only the anasarca disappeared most speedily, but the urine returned to its natural amount, and got rid of its sero-albuminous impregnation, were those in which blood-letting was employed in the manner now mentioned. This method of treatment I have used for many years, previous to the time at which Dr Bright's Reports appeared, and subsequent to that date, and have always found it the most efficacious.

Depletion in the same manner and at the same rate is not less clearly indicated in those cases in which, either with dropsical infiltration or without it, the patient is attacked with lethargic, apoplectic, or epileptic symptoms.

There are many cases, however, in which the symptoms of pulmonary or cerebral congestion are either not present, or they may have been moderated; and even where the anasarca remains in a slight degree in the shape of solid firm œdema. In this

class of cases, after one or two general blood-lettings to reduce the frequency and fulness of the pulse, the best course is blood-letting from the dorso-lumbar region by cupping, to the extent of 8, 10, or 12 ounces, repeated every second, third, or fourth day, according to circumstances. This evacuation is generally followed in the course of 20 or 24 hours with a copious flow of urine, or at least a considerable increase in the amount of that secretion, and diminution in the swelling of the belly, the legs, and feet, the labia and scrotum.

2. Purgative medicines, and especially the drastic and hydragogue cathartics, as they have been named, have been in general use from very remote antiquity as remedies in dropsy. The medicines to which the ancients chiefly trusted for this effect were hellebore, melampodium, (*Helleborus niger*,) (*Veratrum nigrum*,) a species of fern (*filicula*,) and copper in scales (*Squamæ aeris*,) (Celsus, lib. ii. cap. xii.) In modern times gamboge (*Stalagmitis cambogioides*,) extract of squirting cucumber (*Momordica elaterium*,) of colocynth (*Cucumis colocynthidis*,) bryony (*Bryonia alba*,) jalap-root powder (*Convolvulus jalapa*,) scammony (*Convolvulus scammonia*,) hedge-hyssop (*Gratiola officinalis*,) and the berries of buck-thorn (*Rhamnus catharticus*), are the ones principally in use. Their power in inducing numerous watery stools, that is, a copious discharge of serous fluid from the intestinal mucous membrane, is undoubted. But it does not always follow that this discharge removes the watery collection within the serous membranes; and what is worse, they may, without effecting this main object, cause serious, but unavailing weakness and exhaustion. It is perhaps for this reason that the employment of such violent medicines has been almost abandoned in the modern treatment of dropsy; and physicians place greater reliance on purgatives, exhibited in such manner as to regulate the action of the intestines, and cause their periodical evacuation. For this purpose any of the common gentle laxatives, as castor oil, senna, the aloetic pill, or cream of tartar, may be employed; and, if they are insufficient, a more active one may be first administered and then followed up by the milder medicines. For this purpose, the croton oil, especially in the form of soap, is well adapted. A very good and efficient laxative is the compound jalap powder, with fifteen grains of carbonate of soda in the drachm.

3. *Diaphoretics*.—Though blood-letting and the consequent confinement to bed are often most efficient diaphoretic agents, and are indispensable in the treatment of the early and congestive stages of renal disease, and though often the skin becomes spontaneously warm and moist, after the tension of the vascular system has been reduced, and the intestinal canal has been effectually evacuated; yet it is often advantageous to facilitate the restoration of the cutaneous functions by the administration of suitable diaphoretics. The most convenient is Dover's powder, which should be given to the extent of fifteen grains or one scruple at bed-time. But if there be a tendency to squeamishness or vomiting, the best plan is to give opium alone. Minute doses of tartrate of antimony and solution of muriate of morphia are also useful forms of diaphoretic remedies. Acetate of ammonia has been also given; but it is perhaps more liable to the same objection already made against ipecacuan, where symptoms of gastric irritability are prominent.

On the whole, the best diaphoretics in this disease next to blood-letting and laxatives, are moderate unstimulating diet, confinement in bed, and the occasional use of the warm or hot bath. When the patient rises, flannel clothing is indispensable; and it is sometimes beneficial even in bed.

Dr Osborne is the great patron of the diaphoretic method of treatment. Though its merits are great, he places on it too much reliance, and ascribes to it a degree of influence which I have not had the good fortune to witness.

4. *Diuretic medicines* have been long in use for the removal of dropsical collections, chiefly on account of the scanty urine which attends them, and because it was imagined that whatever increased the flow of this secretion, would also diminish the morbid accumulation. A more improved pathology has shown that the diminished secretion of the kidneys was not a cause of dropsy, but another effect of the same cause which produced the dropsical effusion. Till this cause is removed, or its operation is prevented, diuretics can be of no service, as they operate not on the cause, but on the effect, of the disease; and this explains the fact mentioned by Cullen, and complained of long before his time, that the operation of diuretics, either in increasing the urinary discharge or removing dropsical collections, is extremely uncertain. The truth is, that in diseased

kidney, before the renal congestion and inflammation are considerably abated by the use of blood-letting, they are either entirely useless, or directly injurious; and after this, their influence is secondary only. It must also be remarked, that they are of almost no effect unless taken with a large quantity of cold water; and in many persons this alone will be a powerful and certain diuretic. It is for these reasons that diuretics, which are to be regarded chiefly as stimulants, the particular operation of which is directed to the kidney by the quantity of fluid taken into the stomach, ought, when administered for the cure of dropsy, to be preceded by suitable blood-letting, and accompanied with the liberal use of diluent watery liquors, with gentle exercise if possible, in a cool dry air. Under these circumstances, the urine in general becomes clear, more watery and more copious; and the dropsical accumulations generally abate in proportion.

If these remarks on the real virtues of diuretics are well-founded, the choice of individual diuretics becomes a matter of indifference. Yet in this physicians have been somewhat particular; and they have not only been at some pains to ascertain the comparative merits of various diuretic substances; but the efficacy ascribed to each diuretic has varied at different times, according as it has been found successful in the hands of different practitioners in removing dropsical accumulations. Thus Francis Home, who made an extensive trial of the crystals of tartar, (bitartrate of potass,) after the manner of Vincentio Menghini, regards that salt as the most safe and hydragogue, and it has the advantage of answering remarkably well in the treatment of disease of the kidney. In the tonic pills of M. Bacher, which were much celebrated, both in France and in this country, for the cure of dropsy, reliance is placed on extract of hellebore, which forms the basis of that nostrum. Dr Millman, though he used vinegar of squill and purges of jalap and calomel, yet, in imitation of Menghini, trusted chiefly to cream of tartar in large quantities of water. Darwin and Withering, again, thought foxglove the most powerful diuretic medicine on the list; and in this opinion they were joined by Percival, Ferriar, and others. Magennis thought it unsafe to use either hydragogues or diuretics alone; and with the view of giving tone and energy to the system, he combined them with chalybeate and alkaline tonics. Collins of Vienna praised the

strong scented lettuce (*Lactuca virosa*), as a safe and effectual diuretic; three French physicians gave their testimony in favour of the infusion of bitter-sweet (*Solanum dulcamara*); and Fowler of York recommended infusion of tobacco in doses of from sixty to eighty drops twice daily. (1785.)

It is to Dr Ferriar of Manchester, however, that the profession is most indebted for information on the comparative powers of hydragogue remedies in general, and of diuretics in particular, in the removal of dropsy. After an extensive and accurate trial of various remedies, among which are foxglove, cream of tartar, Bacher's tonic pills, Dover's powder, gamboge with cream of tartar, gamboge with mercury, calomel with squill, infusion of tobacco, and lastly, decoction of golden rod (*Solidago virga aurea*), he found foxglove, though occasionally diuretic to a wonderful degree, yet not invariably hydragogue, and gave the preference with Menghini, Home, and Millman, to cream of tartar as the most certain and effectual hydragogue. At a subsequent period of his researches, however, he came to the conclusion, that the extract of wild cucumber (*Momordica elaterium*) was the most certain and powerful remedy for the cure of dropsy in the hands of the physician. The explanation of this discordance is to be found in the fact, that there are certain periods in the course of dropsical diseases, at which diuretics neither operate on the kidneys, nor on the arteries of the serous membranes. "Each of them has succeeded where the patient was properly prepared for their employment; but it appears plainly, that none of them will prove effectual if they are prescribed too early." "I still find cream of tartar a sure and powerful hydragogue."—Vol. ii. p. 198.

In 1814, a remedy, possessing not only diuretic but tonic properties, was thought to be found in the umbelled winter-green (*Pyrola umbellata*), *de paigné* of the Indians, *l'herbe a pisser* of the Canadians. It appears from the testimony of Dr Smith Barton of Philadelphia, that this plant has long been a principal article in the materia medica of the Indians of North America, where it has the reputation of being a sovereign remedy for gravellish complaints and affections of the urinary organs in general. In 1814, Dr Somerville called the attention of the profession to its diuretic properties, which he represented as very powerful, and of much use in evacuating dropsical waters. In the cases in which it was first tried, a

strong infusion of the whole plant was taken to the amount of a pint in twenty-four hours. But he found that an ounce of the dried plant, including root, stalk, and leaves, cut small and macerated twelve hours in cold water, and boiled till it yielded one pint of strained liquor, acted with greater energy than the infusion. It has been remarked to be followed with an agreeable sensation in the stomach, and in some instances an extraordinary increase of appetite.*

Of two or three remedies, which have been out of use for a considerable time, little need be said. The dandelion (*Leon-
todon Taraxacum*,) which was in great repute and general use about seventy years ago, is beginning again to claim notice, since the recommendation of Pemberton and Wilson Philip, in the form of an inspissated extract. I can assert, however, from experience, that in this form it is almost inert as a diuretic, and indeed in producing any sensible operation whatever; and unless the recent plant can be obtained and a strong infusion of the roots prepared and administered with nitre, it has no influence on the urinary secretion. Meadow-saffron (*Colchicum
autumnale*,) though more known as an irritating and drastic purgative, was highly praised by Stark, Collins, and Plenck, for its diuretic powers in dropsy of the chest and lungs, and other watery accumulations. It is given in the form of syrup, vinegar, or wine; but is uniform in its diuretic powers in neither. In Scotland the tops of the broom-plant (*Spartium Scòparium*) have long been in popular use as a safe and efficacious medicine, possessing both purgative and diuretic properties. Cullen was in the habit of ordering an ounce of the fresh tops to be boiled in a pound of water down to one-half, and of giving two table-spoonfuls of the decoction every hour till it operates by stool or urine, which it rarely failed to do; and, by repeating every day or every second day this, he informs us he cured some dropsies.†

A point of more importance, perhaps, than the comparative powers of different diuretics, is that of their relative fitness for different dropsical affections. There is certainly some foundation for the notion, that one kind of diuretic medicine will

* On the Diuretic Properties of the *Pyrola umbellata*, by W. Somerville, M. D. Medico-Chirurgical Transactions, Vol. v. p. 340, and some observations concerning the Medical Properties of the *Pyrola umbellata*, and the *Arbutus Uva-Ursi*, by Professor Smith Barton, Vol. vii. p. 143.

† *Materia Medica*, Vol. ii. p. 534.

be more effectual than another in removing dropsy of the chest, and more effectual in removing dropsy of the chest than dropsy of the belly. Others, again, which operate speedily on the latter disease, may be inert in the former. Thus foxglove and squill have been generally found most expedient in dropsy of the breast, crystals of tartar and hellebore, elaterium or the drastic cathartics in dropsy of the belly, and calomel and squill, the blue pill and squill, or crystals of tartar in general dropsy. Baillie informs us that he found hydrothorax, when unconnected with disease of the heart or lungs, in general more readily affected by medicine than ascites or ovarian dropsy; and the most efficacious remedy in his experience in its treatment was mercury combined with squill and foxglove in the proportion of five grains of the blue pill, with one grain of the powder of squill and half-a grain of that of foxglove given twice or thrice daily. In ascites, on the other hand, he found cream of tartar and small doses of elaterium to be the most generally beneficial medicine. The principle on which this success depends has been in some degree indicated by Dr Crampton, who suggests that elaterium will be found to answer better in those dropsies connected with disease of the serous membranes of the abdomen, where there is torpor of the mucous coats; but in delicate and irritable conditions of the mucous membrane of the stomach and intestines, it is less appropriate, and may be prejudicial.

This view of the comparative efficacy of diuretics, and of their relative fitness to different forms of dropsy, shows that the choice of the medicines to be employed is of less importance than choosing a proper season or period of the disease for their exhibition; and that, unless the primary cause of the morbid effusion is removed, in whole or in part, by suitable evacuation, and the use of antiphlogistic remedies, neither hydragogue cathartics nor diuretics will be of any avail. One inference, however, may be mentioned. The general use of foxglove and squill, or of cream of tartar, shows that they are upon the whole most entitled to dependence; but unless their exhibition is preceded by blood-letting, and accompanied with adequate dilution, they will either entirely fail, or lose much of their effect. The two former drugs, if given in substance, are generally combined with aromatic confection. A combination which I have found very useful not only in removing anasarca in renal

disease, but other symptoms, is a pill consisting of one grain of foxglove powder, and half a grain of opium, twice or three times daily. When foxglove is given in tincture, it is conveniently conjoined with sweet spirits of nitre and cinnamon-water. Squill may be given in syrup or in vinegar, with a similar vehicle; but it is perhaps most certain in effect when given in pill. These medicines are best administered in very small doses.

5. In the treatment of dropsy, it has been long the practice to exhibit mercury either in the form of calomel or blue pill, by the mouth, or in that of inunction with the blue ointment; and there is no doubt that, under its use, dropsical symptoms have not unfrequently disappeared, and even a recovery has taken place. Its actual influence over the dropsical process, however, may be justly questioned. Dr Blackall has shown that the long and repeated use of mercury predisposes very powerfully to dropsical effusion, and that the first symptoms of dropsy often appear during the operation of a full course of mercury. (Chap. xiv. p. 245, 3d edit.) To this it may be replied, that the formation of dropsy under the use of mercury is no proof that the mineral is incapable of removing it; for we perceive that it both causes and removes various complaints, such as cutaneous eruptions, iritic inflammations, pains of the bones, and the like. It is almost unnecessary to show here, that its influence in removing these complaints is very problematical, while its power of inducing them is beyond doubt. Its failure, also, in effecting permanent cures in dropsy is well known; and much as it has been thought to co-operate with squill and foxglove in increasing the urinary secretion, it is by no means invariably successful in effecting the discharge of dropsical collections. Dr Crampton ascribes this inefficiency of the mineral to the stage of the disease at which it was exhibited, (Report, p. 270); when it fails, he says, by adding to the excitement, and increasing the inflammatory disposition; but if employed after venesection and other preparations, it proves a remedy of no inconsiderable efficacy. To this, however, we have only to answer what has been already said, that if the morbid process of the dropsical effusion is subdued by previous evacuation, little remains to be done by mercury; and if it is not, it is of no moment whether mercury or any other medicine be administered.

It must also be remembered that the exhibition of mercury

in many persons is not free from danger. Its bad effects in inducing fatal enteritis in children have been noticed already. We have seen it produce a fatal eruption of the skin, where it was exhibited to remove universal dropsy ; and in one of Dr Crampton's cases, (the 17th), the blue pill taken for ten days was followed by violent swelling and inflammation of the whole face, mortification of the integuments, and death in little more than eight days, (p. 189).

But the great objection to the employment of any preparation of quicksilver for the cure of renal dropsy, consists in the fact, that the use of the mineral is known to render the urine albuminous, to increase the inflammatory state of the system, and to induce the disease, the effect of which it is expected to remove. Another evil is, that in persons labouring under symptoms of granular kidney, a very small quantity of mercury induces ptyalism, and renders the mouth tender, and most painfully sore. This, I believe, depends much on the fact, that patients of this description have, in general, if not always, been subjected previously to the full influence of the mineral in repeated courses.

For these reasons, mercury should never be exhibited without the previous full trial of other remedies ; as even assiduous watching will not always succeed in preventing bad effects.

6. On the same principle on which blood-letting is recommended low diet is to be observed. It is unfortunate that the term is somewhat vague, and may be variously interpreted, according to the ideas of different persons. It is requisite, therefore, to say, that by low diet is understood food principally composed of bread or farinaceous matter, in no great quantity, and of watery diluent liquors. All animal matters must be excluded, excepting milk diluted with water or common whey ; and even the former should not be much indulged in. Of drinks, the safest is either pure water, or any of the aromatic vegetable infusions, as lemonade, ginger, tea, or the acid vegetable drink of the Edinburgh Infirmary. Ginger-beer makes a pleasant and refreshing beverage to the dropsical, and ginger-wine diluted with water is also useful in quenching thirst and increasing the flow of urine. Gin-punch, so much used in the treatment of dropsy, is not admissible in the early stage, while symptoms of inflammation or congestion are still present, but may be employed by convalescents. By persevering for eight or ten days, or two weeks,

at the most, in this mode of diet, a sensible impression ought to be made on any dropsical effusion which is likely to be removed in this manner. If no impression is made, then it is to be inferred, that the cause of the effusion is beyond the reach of the agent.

Exercise, if the patient is able to bear it, should never be neglected. It operates not only in aiding and promoting the motion of the venous blood in general, but in rendering the capillary circulation, and especially that concerned in secretion, more easy and fluent. Carried to a considerable extent in a warm atmosphere, it increases the discharge from the skin. In moderate degree, and in a cool air, it increases greatly the urinary secretion, and renders the alvine discharge more copious and regular. It is in the latter mode, therefore, that it is most beneficial in the removal of dropsy. In the inflammatory stage of the disease, while the breathing is oppressed, and the pulse, skin, and mucous surfaces, still indicate a feverish state, it is hardly admissible, at least, to any considerable extent. But as soon as these symptoms have been abated by suitable evacuation, it ought to be adopted with as much vigour as the strength of the patient will allow. It is then the great remedy; and in dropsies in which these symptoms of plethora or much vascular distension are wanting, or less in degree, it will often alone be adequate to a cure.

As a variety of exercise, friction may be mentioned. This measure, which operates both by promoting the motion of the venous blood, and by accelerating the capillary circulation of the parts to which it is applied, is well adapted for diminishing the œdematous swelling of the legs and feet; and, notwithstanding the doubt expressed of its efficacy by Cullen, it has been often used with success in abdominal dropsy. One instance of the latter disease we saw disappear entirely and permanently under the daily use of friction of the belly by the hand dipped in oil. When the legs and feet are œdematous, they may be rubbed with the flesh-brush, or by the hand enveloped either in a chamois glove, or in a piece of soft dry flannel. This operation is practised in general in the evening; but Cullen thought the morning, when the swelling is much gone, the most convenient season.

7. Tonic remedies have been also accounted necessary in the treatment of dropsical diseases. They have been used with

two intentions, either as diuretics, when the disease was supposed to depend on debility, or afterwards as tonics, when the dropsical symptoms were removed with the view of giving strength to the system, and preventing a relapse. Their real efficacy in either way has been much overrated. But dropsical symptoms have been occasionally observed to disappear under their use. The best and most commonly used is iron, in the form of muriated tincture, sulphate, or alkaline solution. The first is perhaps the most convenient, because with tonic it shows undoubted diuretic powers. It may be given in the dose of ten, twelve, or fifteen drops, largely diluted in water, four or five times daily. The second is best adapted for that stage of dropsy in which the symptoms are beginning to yield, or have already disappeared. A pill containing two or three grains of it, with half a grain of digitalis, and a suitable quantity of aromatic confection, may be given twice or three times daily, according to circumstances. Of the alkaline chalybeates either the ammoniacal or the tartarized may be used; but they have no peculiar advantage over the muriate and sulphate. Peruvian bark and other bitters have been also used with the same intention. It must not, however, be forgotten, that the exhibition of steel, bark, or other tonics has often aggravated the disease, and has not unfrequently converted a case of hemorrhage or mere congestion into an obstinate and incurable dropsy. (Stahl, Blackall, p. 251.)

8. It is often requisite to administer remedies with the view of controlling or alleviating several distressing symptoms, such as vomiting, diarrhoea, thirst, and similar uneasy feelings.

For diminishing the frequency and allaying the severity of vomiting, various remedies have been used with little avail. Opiates and small quantities of spirituous cordials often seem to stop the symptom; and with this view the thebaic pill, half a drachm of ether, a little gin, or a little brandy, are often beneficially administered. Sometimes a little solid food, as the broiled wing of a fowl or a morsel of broiled meat, is retained, while all fluid articles and vegetable matters are rejected. The effervescing draughts, also, with or without a little solution of muriate of morphia, (five drops,) are retained, and stop the irritability. Lastly, hydrocyanic acid and creosote have been both employed to alleviate or remove this symptom, sometimes with, more frequently without, good effect. Of the former

three to four drops, of the latter one, may be given in cinnamon-water. I cannot say that I have been fortunate with either. Rubefacients and revellents, as sinapisms and blisters, are also beneficial.

For diminishing the frequency of the liquid motions the ordinary remedies, as chalk mixture, thebaic pill, Dovers' powder, or electuary of catechu are decidedly the best. The amylaceous enema should be administered if these fail. But all medicinal remedies are inert without much attention to diet, which should consist of the boiled farinaceous grains, with moderate proportions of well-dressed animal food.

When there is reason to believe that the diarrhoea depends on follicular disease, the appropriate remedies ought to be administered. Fashion assigns almost the first place to acetate of lead and opium, which should be given in pills. It sometimes succeeds, but more frequently fails. Revulsion by means of sinapisms over the belly, or blisters applied repeatedly over the right iliac region, the umbilical region and the epigastric region, sometimes prove advantageous. Chalk and opium, calomel and opium, or mercury and chalk, are also employed as antidotes against this symptom; the first is safe enough, but the rule already established against the employment of mercury in other forms of the disease is not less obligatory in this. If any one doubts it, it is right to inform him that instances have occurred in which patients presenting this symptom have been thus treated, and have been speedily brought to the tomb by its means. To speak of it in the gentlest terms, it is a sort of bad empiricism.

In the case of somnolence or lethargy, it is hard to say what should be done. Theory and analogy suggest the use of depletion from the head, revulsion, and cold applications. But the affection proceeds so rapidly that they have rarely time to operate in producing any decided effect. Almost invariably, indeed, nothing can be done to remove this symptom, or to avert the fatal termination. It is desirable, nevertheless, to administer enemata containing oil of turpentine, and to apply sinapisms to the loins and lower extremities.

§. II. Diabetes. *Diabetes Insipidus et Mellitus. Melituria.*

Martini Lister, Octo Exercitationes Medicinales de quibusdam Morbis Chronicis. Edit. ultima. Auct. et Emend. Amstelodami, 1698. De Diabete Exercit.

Altera, p. 35.—Experiments and Observations on the Urine in a Diabetes. By Matthew Dobson, M.D. of Liverpool. Medical Observations and Inquiries, Vol. v. p. 298. London, 1779.—Clinical Experiments, Histories and Dissections. By Francis Home, M.D. &c. 3d edition, corrected. London, 1783. Section xvi. p. 319, Diabetes.—Observations on Diabetes Mellitus, &c. By John Rollo, M.D., in 3 volumes, 8vo. London, 1797, 1798.—A Case of Diabetes, with an historical sketch of that disease. By Thomas Girdlestone, M.D. 8vo. Pp. 112. London, 1799, (contains information concerning Dr Lubbock's cases.)—Case of Diabetes, with an account of the appearances after death, stated in a Letter to Dr Rollo. By Alexander Marcet, M.D. &c. Med. and Phys. Journal, ii. p. 209. London, 1799.—Account of a Case of Diabetes, &c. By Matthew Baillie, M.D. Transactions of a Society, Vol. ii. p. 70. London, 1800.—Two Cases of Diabetes, with observations, &c. By John Bostock, M.D. Memoirs of Med. Soc., Vol. vi. p. 237. London, 1805.—Nicholas et Gueudeville, Recherches et Experiences sur le Diabete sucré ou la phthisie sucré. Paris, 1805. Journal de Medecine continué, vi. p. 442.—Medical Reports of Cases and Experiments, with observations chiefly derived from Hospital Practice, &c. By Samuel Argent Bardsley, M.D. &c. London, 1807.—History of a Case of Diabetes Mellitus, &c. By George Alley, M.D., M. and S. Journal, Vol. iv. Edin. 1808.—Cases by Dr James Clarke in M. and S. Journal, iv. and v. 1808, and 1809.—Cases of Diabetes, Consumption, &c. with observations, &c. By Robert Watt, Member of the Faculty of P. and S. Glasgow. Paisley, 1808.—Facts and Opinions concerning Diabetes. By John Latham, M.D. &c. London, 1811.—On the non-existence of Sugar in the Blood of persons labouring under Diabetes Mellitus, in a Letter to Dr Marcet, with his Reply. By W. Hyde Wollaston, M.D., Sec. R. S. Philosophical Transactions, 1811.—Medical Histories and Reflections. By John Ferriar, M.D. Vol. i. p. 130, Vol. iv. p. 47. London, 1811.—Experiments on the Urine discharged in Diabetes Mellitus, with remarks on that disease. By William Henry, M.D. &c. Medico-Chir. Trans. ii. p. 118. London, 1811.—Observations on Diabetes Insipidus. By John Bostock, M.D. of Liverpool. Medico-Chirurgical Transactions, Vol. iii. p. 107. London, 1812.—Two Cases of Diabetes Mellitus treated with opium. By Pelham Warren, M.D. Med. Trans. Vol. iv. London, 1813. P. 188; and Cases of Diabetes. By Richard Patrick Satterley, M.D. Ibid. Vol. v. p. i. London, 1815.—On the effects of large doses of opium in a case of Diabetes Mellitus. By Mr William Money, Medico-Chirurgical Transactions, Vol. v. p. 236. London, 1814.—Observations on the nature of some of the proximate principles of the Urine, &c. By William Prout, M.D., Ibid. Vol. viii. p. 526. London, 1817.—Further Observations on the proximate principles of the Urine. By William Prout, M.D. Ibid. Vol. ix. p. 472. London, 1818.—An Inquiry into the Nature and Treatment of Diabetes, Calculus, &c. By William Prout, M.D., 1st edit. Lond. 1820; 2d, 1825.—Observations on the Treatment of Diabetes Mellitus. By Henry Marsh, M.D. A.B. Dublin Hospital Reports, Vol. iii. p. 431. Dublin, 1822.—Urinary Diseases and their Treatment. By Robert Willis, M.D., &c. London, 1838. 8vo.

THE term *Diabetes* has been generally applied by nosologists to every disease in which there is an unusual discharge of urine. In the present instance, it is restricted to that disease in which the urine contains a proportion, greater or less, of saccharine matter, whether its quantity be or be not unusually copious.

Dr Willis appears to have been the first who remarked the sweetness of the urine in diabetes ; and almost every physician of England has observed it since his time. Martin Lister, indeed, appears to have met with an instance of the disease in which the urine was tasteless ; Cullen informs us, that he had met with at least one example of the same phenomenon ; and Dr Bostock subsequently established the fact, by showing that, with a preternatural increase in the quantity of water discharged, a much greater proportion of urea, the proper substance of urine, is conveyed out of the system in a given time, than what takes place in the state of health ; and that this increased secretion is attended with considerable disorder of the functions, and much wasting of the flesh and strength.* These examples have been satisfactorily explained by Dr Prout, who considers them as disorders of the general system, producing an increase in the usual proportion of urea, and thereby more or less diuresis.

§. I. According to the observations of this accurate chemist, the average specific gravity of the urine in this state seems to be a little above 1.020, and to vary occasionally from 1.015 to 1.030. In the healthy state, it has been estimated between 1.010 and 1.015. It is generally pale, but may be high-coloured, and then resembles porter diluted with water ; and this variety may take place more than once in the urine of the same individual. It is generally free from sediment, except the mucous cloud of healthy urine ; and the only remarkable property which it appears to possess is that of containing urea in such abundance, that the addition of nitric acid causes speedy crystallization. When first voided it reddens litmus paper ; but its great proportion of urea renders it prone to decomposition when it becomes alkaline, especially in warm weather.

This state of the urine is attended with a frequent and urgent desire of passing water both night and day ; and as the quantity of watery vehicle is or is not increased, the absolute quantity of fluid urine will be increased or remain the same. It appears to be particularly liable to be increased during cold weather, and by all causes producing mental agitation. The patient sometimes complains of a sense of weight or dull pain in the back ; but this is not constant. There is also occasional irritation referred to the neck of the bladder, and stretching

* Observations on Diabetes Insipidus. Medico-Chirurg. Trans. iii. p. 107. London, 1812.

along the urethra. The pulse is not affected; the state of the skin is either natural or at least readily becomes moist; and there is neither thirst nor craving for food, except in extreme cases. The tongue is generally clean; and the regular and natural state of the dejections show, that neither the stomach nor bowels are much disordered.

In most instances of this disease hitherto observed, the subjects have been middle-aged men, of thin spare habit, with an expression of hollow-eyed anxiety in their countenance, free from gout and constitutional disease, and, as far as could be ascertained, from permanent organic defect in the urinary organs. In every instance, they have been induced to apply for advice, not so much from pain, as from inconvenience, and the apprehension of the complaint ending in something worse. In several instances, they have confessed that they have been addicted to masturbation from very early youth.

On the causes of this derangement in secretion nothing else is accurately known. Whatever weakens the system, especially the urinary organs, may produce it; and it may, therefore, appear under those circumstances which give origin to albuminous urine, to diabetes, and the deposition of the phosphatic salts, in which Dr Prout thinks it may terminate.

The most effectual remedies are opium in large doses, astringent medicines which exercise a tonic effect, and sedulous attention to diet, avoiding intemperance, and every cause which may either weaken or over-excite the organs concerned in digestion.

§. II. It is very different with diabetes, which causes more serious derangement in the functions and general health, and is much less readily influenced by medicine or remedies.

SEMIOGRAPHY.—This disease may come on slowly and imperceptibly without previous disorder, or it may appear after exposure to cold, an injury or a surfeit, in persons previously in health, or in others who have suffered a long train of undefined complaints. In some instances it has been known to continue for a long time, and proceed to a considerable extent without causing any remarkable disorder of the system. In general, however, its approach is attended with great, incessant, and unquenchable thirst, dryness of the mouth and throat, gnawing pain of the epigastric region, and a sense of heat in the bowels, which is at first a little pungent only, but even-

tually increases. As the thirst impels the patient to drink, the urine is sensibly increased in quantity; and as he feels the incessant returns of calls to void it, he is sensible of much weakness and loss of strength. As the disease goes on, the pulse becomes quick and small; the skin hot, dry, and imperspirable; and the flesh and strength of the patient waste apace. The tongue at the commencement is white and foul, but becomes unnaturally clear and red when the disease is fully established. The appetite is great, sometimes quite ravenous; and though much nutritious food is eaten, no strength is gained. On the contrary, the weakness and emaciation increase; the skin becomes dry and shrivelled, and hangs over the wasted muscles and the exposed bones; both sexes suffer extinction of venereal desires, with more or less pain in the back and loins; breathlessness follows the slightest exertion; headach, giddiness, and indistinct vision, with a listless, imbecile, and peevish state of mind concur, with corporeal weakness and languor, to render the patient unfit for any exertion. And after no long time, the wasted body pines away by a slow but sure process of decay; or the symptoms of dropsy, consumption, or some other malady supervening bring on the fatal event; or life is suddenly and abruptly terminated by apoplexy, or a peculiar spasm of the stomach induced by improper food.

The inordinate quantity of urine voided in this disease, which always attracted attention, varies much in its proportion to the fluids drank. Cases are recorded in which thirty pints have been discharged every twenty-four hours for weeks and even months together. Cullen believed that it exceeded not only the liquids taken in, but sometimes the whole of the solids consumed, (1505). Home was led by his observations to the same conclusion, (p. 334); and inferred that the excess was derived from wasting or consumption of the living body. This was doubted by Rollo, and afterwards by Lubbock, (*Medical and Physical Journal*), but appears to have received fresh confirmation in the cases of Bardsley, (p. 170). Dr Watt has again called in question the accuracy of the facts on which this has been stated, and asserts that, according to his experience, though the urine may, for a night, a day, or even longer period, exceed what was taken in, yet, on an extensive average, it has always come short, (p. 159). In this Dr Prout has recently concurred; and it must be acknowledged, that more ac-

curate facts than any yet published would be requisite to confirm the statement, and to render it the foundation of any reasonings.

The urine voided in this disease is always very clear, and at first sight appears to be colourless. But when viewed in a certain light, it appears to have a pale straw or yellowish-green tint, which has caused it to be compared to a solution of honey in a large proportion of water. Its smell is faint and peculiar, resembling sweet whey or milk. Its taste is always more or less sweet. Its specific gravity varies from 1.020 to 1.050, or even higher. The quantity of urea is always much diminished, but never totally absent. It contains little or no lithic acid; and the saline matters, if healthy, though in the same relative proportions, are much diminished in absolute quantity. Diabetic urine may also contain blood (Watt), albuminous matter, analogous to chyle, or a white milky fluid, precisely similar to chyle, which subsides slowly to the bottom of the vessel. In this case, the process of vinous fermentation takes place rapidly, the chylous matter acting like yeast. (Prout.)

The saccharine state of diabetic urine depends on the presence of a notable proportion of sugar. Since the time when Dr Dobson of Liverpool first established this fact by experiment, numerous analyses have been performed by Cruickshank, by Lubbock, by Bostock, by Nicholas and Gueudeville, by Thenard, by Marcet, by Henry, by Prout, and others, from all of which it appears that the sugar of diabetic urine differs in no respect from that obtained from the sacchariferous plants. Like it, it is susceptible of crystallization, and by the action of nitric acid may be converted into oxalic acid. Prout also found that it contained the same proportion nearly of proximate principles, or at least differed only in yielding a trace of azote. (Medico-Chirurg. Vol. viii. p. 537.)

It was at one time imagined that diabetic urine was entirely deprived of its *urea*, in place of which saccharine matter was supposed to be substituted. This opinion, which was adopted after careful analysis by Cruickshank, Dalton, Fourcroy, Nicholas and Gueudeville, and Thenard, was contradicted by Bostock, who obtained from diabetic extract, treated with nitric acid, not oxalic acid only, but nitrate of urea. He afterwards, however, was induced, by further experiments, to adopt the general belief of the complete absence of urea. Dr Henry has determined this

point, by showing that a small portion of urea was co-existent in diabetic urine with a large proportion of sugar ; and that the presence of this principle was indicated in the production of ammonia in the destructive distillation of the extract. (*Medico-Chirurg. Trans.* Vol. ii. p. 125—129.) In point of fact, the presence of azote in the experiments of Prout was derived not from the sugar, as he imagined, but from the small portion of urea still left in the urine.

The accuracy of the original inference of Dr Bostock has been since confirmed by Mr Kane of Dublin, who obtained from diabetic urine nitrate of urea, by using diluted nitric acid, and plunging the mass thus formed into a freezing mixture of salt and water. It is thus proved that diabetic patients void, in a given time, as much urea as healthy patients ; and it hence results, that the urea is merely disguised by the large amount of sugar.*

At the same time it must be remarked, that the true explanation of this discrepancy is to be found in the fact, that the relative proportion of these two ingredients varies at different periods of the disease. It is unreasonable to suppose the disease to commence so suddenly, that all the urea should abruptly disappear, and sugar be as abruptly formed. It is more rational to suppose, that, at the commencement of the diabetic symptoms, whether the proportion of urea diminishes or remains the same, a quantity of sugar is secreted. As the disease advances these proportions continue to alter, until the urea, which was originally in the ratio of majority to the sugar, becomes eventually in the ratio of minority. Whether it disappears entirely in extreme cases and towards the close of the disease, seems very doubtful ; for no well authenticated case has been yet adduced in which accurate chemical analysis has demonstrated the total absence of urea ; and both Mr Kane and Mr Macgregor maintain that diabetic patients discharge as much urea as healthy persons.

PATHOLOGY.—Though less is known of the proximate causes of this disease than of any other, perhaps, in the whole list, this has not prevented various opinions from being given on it.

It was the opinion of Dr Mead, that diabetes depended on a morbid state of the liver and bile. This opinion, however, was refuted, first, by Cullen, (1511,) then by Francis Home, (p. 338,) and afterwards more fully by Baillie. Cullen (*Tran-*

* *Dublin Journal of Medical and Chemical Science*, Vol. i. p.15.

sactions of a Society, Vol. ii.) was inclined to ascribe it to a fault in the assimilatory powers, or in those employed in converting alimentary matters into the proper animal fluids,—a doctrine which was espoused by Francis Home, and afterwards more fully maintained by Dr Dobson. This opinion, which rested principally on the assertion, that the serum of diabetic blood was sweet, was controverted by Baillie; and as this fluid was afterwards repeatedly examined with much care by Nicholas and Gueudeville (*Ann. de Ch.* xliv. 69), by Dr Wollaston, by Henry, and, lastly, by Prout (*Medico-Chirurgic.*) without furnishing any saccharine matter, it was allowed that sugar did not exist in diabetic blood. Neither is it requisite to dwell on the false assumption employed by Dr Darwin, that diabetes is produced by a retrograde motion of the absorbent vessels from the lacteals into the lymphatics of the kidneys or bladder.

Notwithstanding these objections, Dr Rollo attempted to modify this theory by demonstrating the peculiar derangement in the process of assimilation on which he conceived the disease to depend. From the phenomena and effects of diabetes he argues, that it consists in disorder of the stomach proceeding from a morbid change in the powers of digestion and assimilation; that this morbid change consists in increased action and secretion, with vitiation of the gastric fluid, and probably of too active a state of the lacteal absorbents; that the saccharine matter of the disease is formed in the stomach chiefly from vegetable matter; and that the kidneys and other parts of the system, as the head, skin, and lungs, are affected secondarily and generally only by sympathy, as well as by peculiar stimulus. This theory, though then contradicted by the fact, that saccharine matter had been hitherto found neither in the stomach nor in the blood of diabetic patients, derives some confirmation from recent experiments.

Various attempts have also been made, more especially by Dr Lubbock and by Dr Watt, to connect the saccharine state of the urine with the dry, parched, and shrivelled condition of the skin, and the entire suspension of its natural secretion. But the vagueness of the opinions entertained on this head, and the impossibility of converting them into a consistent theory, is an indirect if not a tacit admission of their insufficiency. I shall not stop either to mention or to refute these.

opinions ; but shall proceed to state shortly what seems to rest on good ground regarding the formation and discharge of saccharine urine.

It has been already shown that diabetic urine, though it contains a large proportion of sugar, is not entirely destitute of urea, the peculiar matter of the secretion. Whether the lithic acid and the saline substances are diminished or not, will not affect the inquiry much. The opinion that diabetes depends on a local affection or peculiar state of the kidneys is undoubtedly plausible. But it is certain that this has not yet been ascertained by dissection. For though in one or two instances of diabetic subjects the kidneys have been found vascular, congested, ulcerated, or otherwise diseased, in by far the greater proportion no sensible change could be perceived. (Baillie and Warren.) The vascularity remarked by Baillie and Warren might have been the effect as much as the cause. It is sufficient to say, that in diabetes a very small quantity of natural urine, that is urea dissolved in water, is conveyed, with a large quantity of sugar dissolved in water, out of the system by the kidneys. This saccharine matter is formed partly at the expense of the urea, and mostly at that of the blood or its constituent parts. That part of it is formed at the expense of the urea appears from the diminution which this principle undergoes in extreme diabetes. But that the whole is not formed in this manner is to be inferred, *first*, from the great density of diabetic urine, its specific gravity being always above 1.020, and sometimes so high as 1.050 ; and *secondly*, from the great proportion of solid extract which is obtained by evaporation of a given quantity of the fluid. Thus in the case of Captain Meredith, described by Mr Cruickshank, the solid extract appears at the maximum to have constituted more than one-twelfth of the urine. In the case related by Dr Bostock, in the Memoirs of the Medical Society, one-ninth of a thick syrup was obtained. In the experiments of Nicholas and Gueudeville one-fourteenth of a mass resembling coarse sugar is said to have been obtained. And in those of Thenard it is said to have varied between one-seventeenth and one-thirtieth, the last of which is, perhaps, much below the average.

To form a more distinct idea of the quantity of solid matter conveyed out of the system by the morbid action of diabetes,

we have only to glance at the table constructed by Henry, * who has ingeniously connected the solid contents of a wine-pint of urine, with its density, between the specific gravities of 1.020 and 1.050. Thus, if ten pints of urine of specific gravity 1.040 are voided in twenty-four hours, as each pint contains 766.4 grains of solid extract, the ten pints will contain not less than 15 ounces, 7 drachms and 2 scruples,—which is fully fourteen ounces more than in the state of health. The only source from which this enormous quantity of solid matter can be derived is the blood; and, as we shall attempt to show, from its albuminous part.

By a happy combination of accurate chemical analysis with the definite proportions of the atomic theory, Dr Prout has opened views which we trust will eventually elucidate this subject. As I shall attempt to apply these in some degree at present, I shall give from his researches the following tabular view of the chemical constitution of the three substances of albumen, urea, and sugar:—

* Table, showing the quantity of solid extract in diabetic urine of different specific gravities.

Specific Gravity of the Urine

In degrees and tenths of Twaddell's Hydrometer.	Compared with 1000 parts of water at 60° F.	Quantity of solid extract in a wine pint, in grains & tenths.	Quantity of solid extract in a wine pint, in			
			oz.	dr.	scr.	grs.
4.	1020	382.4		6	1	2
4.2	1021	401.6		6	2	1
4.4	1022	420.8		7	0	0
4.6	1023	440.		7	1	0
4.8	1024	459.2		7	1	19
5.	1025	478.4		7	2	18
5.2	1026	497.6	1	0	0	17
5.4	1027	516.8	1	0	1	16
5.6	1028	536.	1	0	2	16
5.8	1029	555.2	1	1	0	15
6.	1030	574.4	1	1	1	14
6.2	1031	593.6	1	1	2	13
6.4	1032	612.8	1	2	0	12
6.6	1033	632.	1	2	1	12
6.8	1034	651.2	1	2	2	11
7.	1035	670.4	1	3	0	10
7.2	1036	689.6	1	3	1	9
7.4	1037	708.8	1	3	2	8
7.6	1038	728.	1	4	0	8
7.8	1039	747.2	1	4	1	7
8.	1040	766.4	1	4	2	6
8.4	1042	804.8	1	5	1	4
8.8	1044	843.2	1	6	0	3
9.2	1046	881.6	1	6	2	1
9.6	1048	920.	1	7	1	0
10.	1050	958.4	1	7	2	18

	Hydrogen.	Carbon.	Oxygen.	Azote.
Albumen consists of	7.77	50.00	26.66	15.55
Urea,	6.66	20.00	26.66	46.66
Sugar,	6.66	40.00	53.33	

It appears from this table that the absolute quantity of hydrogen in a given weight of urea and of sugar is equal, and that a given weight of sugar contains exactly twice the quantity of carbon and of oxygen which the same weight of urea contains. It also appears, on comparing the constituents of albumen with those of the other two substances, that their several proportions are so arranged as to be either multiples or sub-multiples of each other. Thus albumen contains in one hundred parts the same quantity of oxygen which urea does, but only one-third of the azote found in the latter. It also contains one-sixth part more of hydrogen than either urea or sugar, two parts and a half more carbon than urea, and one-fourth more than sugar.

In the healthy state of the system there is every reason to believe that the elements of the albuminous part of the blood are, in the process of nutrition, placed in such relation as to form urea. Thus while its oxygen remains the same, its hydrogen is diminished by one-seventh, its carbon by two and a-half parts, and its azote is augmented exactly three times. When sugar is formed in the human body, a considerable difference takes place. Though the hydrogen remains the same, the carbon and oxygen are exactly doubled, while no azote is employed in the process at all. It is manifest, therefore, that though the same quantity of hydrogen escapes during the diabetic process, as in the state of health, contrary to what was imagined by Rollo, Lubbock, and others of the chemical theorists, double the quantity of oxygen and carbon escapes, while a proportion of azote, progressively decreasing, if we judge from the small portion of urea or urine which continues to be formed, is discharged from the system.

This view suggests several curious questions. Why is double the quantity of carbon and oxygen discharged during the diabetic process of that which escapes during health? Does azote continue to be discharged, or is it retained in the blood? What becomes of it when it does not escape by the urinary secretion? Does it escape by the lungs or by the skin, or is it retained in the organs. On these points we want,—*first*,

a chemical examination of the blood of diabetic subjects; *secondly*, an accurate inquiry into the effects which their respiration induces on the air; and *thirdly*, comparative observations on the chemical constituents of their blood and organs after death. Even at present there are some points which merit attention.

It may be admitted that the albuminous part of the blood is the source of supply for almost all the organs of the animal body; and upon the healthy state of this substance and the regular supply of its elements by means of food and the process of digestion and respiration, will mainly depend both the growth and the repair of waste in every organic part. It may also be admitted that one great purpose of the urinary secretion is to convey out of the system a large proportion of superfluous azote, united with a small proportion of carbon and oxygen and a still smaller of hydrogen. In diabetes this purpose is frustrated, or imperfectly accomplished, while a twofold waste of carbon and oxygen takes place. As it is impossible to conceive so much oxygen and carbon to be withdrawn, and three times the quantity of azote of the state of health to be left in the blood, without admitting a complete subversion of the usual proportion of the elements of albumen; it is, therefore, to be inferred, that this substance is in every instance of diabetes in a state of complete decomposition. In short, as the albumen of the blood of diabetic subjects loses exactly double the carbon and oxygen which it ought to do, and is further contaminated by three times the quantity of azote which it ought to have, it follows that it is no longer albumen, but a very different substance.

To establish more firmly these conclusions, we still want the confirmation of direct chemical analysis of the diabetic blood. It is certain, however, that, so far as diabetic blood has been submitted to sensible examination, it appears to differ widely from healthy blood. Dr Watt, who appears to have observed the peculiar appearances of diabetic blood most accurately, gives it many characters widely different from those of the healthy fluid. Thus in his first case the whole mass of that not exposed to the air consisted "of a soft black substance, not unlike pitch in appearance, but devoid of tenacity." (Stevenson's Case, p. 23 and 24.) In the next venesection "all the part" is described as "extremely dark, and so devoid of tenacity, that it cannot be elevated with a probe above the surface of the serum."

Similar appearances were observed by Dr Satterley in the blood of diabetic patients. In his first case he informs us, "the appearance of the blood was peculiar; it was a homogeneous mass, in colour almost black, and in it no separation of serum and crassamentum was distinguishable. It had so little cohesion, that a fork passed through it with no greater resistance than through treacle, to which, indeed, it bore a much nearer resemblance than to blood." In another instance of a woman of forty years of age, who had for years laboured under diabetic symptoms, "the blood was precisely in the same state, as dark as treacle, and showing so little disposition to coagulate, that after it had been drawn near an hour, it would flow from the basin like water." (Medical Transactions, Vol. v. p. 6 and 16.) These appearances denote a morbid state of the albuminous part of the fluid.

A curious fact mentioned by Dr Bostock serves to show the connection between albuminous and saccharine secretion. A quantity of diabetic extract, granular and half-crystallized, not dissimilar to fine brown sugar, was left, enveloped in several folds of paper, in a damp room during the winter season. At the end of this time, when the paper was covered with a thick coating of mould, not unlike the mould of cheese, this extract was much diminished in size, had lost all appearance of sugar, was of a viscid consistence like half-melted glue, and had acquired a musty smell. By various tests Dr Bostock ascertained that it was no longer saccharine, but was converted into a substance like coagulated albumen. (Medico-Chirurgical Transactions, Vol. iii. p. 120, 122.)

In this instance of the reconversion of sugar into albumen, the difficulty was, to understand whence the azote had been procured. Was it from the atmosphere, or from a small proportion of urea still remaining in the extract? The latter source is the most probable of the two; and since the discovery of Mr Kane may be regarded as the fact. It is simply possible, that if this principle were present it might furnish enough to form albumen, though not sufficient to make urea; more especially, as the proportion of carbon might be sufficiently abundant if recombinations were formed, to constitute this substance, while it was too copious for the formation of urea.

These views derive further confirmation from the fact subsequently established, that the blood in diabetic patients contains

saccharine matter, and that the latter may be obtained from its serum. MM. Nicholas and Gueudeville first, and Dr Wollaston afterwards, had examined diabetic serum for sugar, but without success; and the known accuracy of the latter chemist had satisfied all pathologists, that sugar did not exist in the blood in diabetes; and, if they did not adopt, they did not controvert the inference of Dr Wollaston, that the saccharine matter must be conveyed from the stomach and duodenum, by some unknown channel into the bladder, without being mixed with the general mass of fluids. Fortunately for the consistency of physiology and pathology, it has been ascertained that sugar may be procured from diabetic blood.

Ambrosiani of Milan first in 1835 announced the fact, that if diabetic blood is diluted with water and boiled, so as to separate the albumen and hæmotosine, and if the clear liquor is filtered and precipitated by diacetate of lead, and the excess of lead removed by a stream of sulphuretted hydrogen gas, the liquor when filtered and evaporated to the consistence of syrup deposits crystals of diabetic sugar.* The same fact was afterwards confirmed by Mr Charles Maitland,† Mr Macgregor of Glasgow,‡ and Dr G. O. Rees of London,|| the last of whom obtained from 1000 grains of diabetic serum 1.8 of sugar.

It appears, therefore, that, in diabetes, sugar exists already formed in the blood; and the fact concurs with others, in showing that the essence of the disease consists in a change in the constitution of the blood.

These facts taken together show the morbid state of the albuminous part of the blood in diabetes. But in what manner this morbid change is effected; whether it causes the saccharine state of the urine, or is along with it a simultaneous effect of the same cause; or to what extent we are to regard it as elucidating the pathology of the disease, it is impossible to say. It is probable that it depends on some derangement of the process of sanguification or *hæmotosis*, though the obscurity of this process, and the imperfect state of our knowledge, render this quite inaccessible to our present inquiries.

ETIOLOGY.—The antecedents of diabetes, and consequently

* Annali Universali di Medicina, Aprile 1835.

† London Medical Gazette, xvii. p. 900, March 1836.

‡ Ibid. xx. p. 221 and 268, May 1837.

|| Guy's Hospital Reports, No. vii. October 1838, Vol. iv. p. 398.

its remote causes, are not well ascertained. It may be true that it frequently takes place in persons who have long had habits of intemperance in drinking; that it takes place in those of broken constitution; or, as it is termed, of cachectic appearance, that it sometimes follows intermittent fevers; that it has been known to occur during excess in drinking mineral waters; and that the disease sometimes appears first, after exposure to cold, great fatigue, or a severe corporeal injury. But there are many instances of diabetes which cannot be traced to any cause whatever; and as such causes are not always or even frequently followed by diabetes, they cannot be viewed in any other light than as mere exciting circumstances which called a previous disposition into action. Dr Prout, particularly, has shown that there is reason in some instances to infer this peculiarity, and that in not a few cases there is something like hereditary or family tendency to the disorder. (*An Inquiry, &c.* p. 69, 2d edition, London, 1825.)

THERAPEUTICS.—The treatment of diabetes is in peculiar circumstances. When it has been conducted on principle, the theory by which it was regulated has been erroneous, and the results have rarely been successful. When it has been empirical, the termination has not always been unfavourable. As we are not convinced that the best pathology would suggest the most effectual treatment in a disease almost invariably fatal, sooner or latter, we shall endeavour to select what truth and long experience sanction as the most likely means of cure.

In the commencement of the disease, if it is recognized early, the dry skin, thirst, sense of internal heat, and irregular or costive state of the bowels, appear to indicate the existence of a degree of feverishness; and if our idea of the morbid state of the blood is well founded, it is reasonable to infer, that these symptoms are connected with the changes going on in the constitution of that fluid. The most likely measure to suspend this process is blood-letting; and the experiments of Watt, Marsh, Crampton, Ayre, and Satterley, show that it is not only not so dangerous a remedy as was at one time thought, but that it is the most likely to make a salutary and effectual impression on the disease. It should be carried to such extent, both in amount and by repetition, as to change the appearance of the blood, and moderate sensibly the symptoms of the disease.

Next to general blood-letting, a local discharge by leeches is of much moment. Blood drawn in this manner from the epigastric region, or by cupping from the loins, will rarely fail to relieve the gnawing uneasiness in the stomach, the fulness, heat, and pain of the bowels, and the weight, distension, and uneasiness referred to the region of the kidneys.

It is of the greatest consequence to evacuate the bowels of diabetic patients freely and regularly. The morbid sensations of pain and heat in the stomach and bowels will thus be diminished; digestion will be performed in a more healthy manner; and the inordinate discharge by the kidneys will be moderated. The rhubarb pill, the aloetic pill, or the colocynth pill, may be used, alternating occasionally with the croton oil soap, the aromatic infusion of senna, or the compound powder of jalap. Severe purging, however, should be studiously avoided.

The dry, harsh, and shrivelled state of the skin denotes the necessity of improving its circulation and secretion. For this purpose the warm bath may be employed occasionally once a week, or twice at the most, if it does not over-stimulate, and if its use does not heat the system too much. On the same principle opium has been found a powerful remedy in diminishing the diabetic symptoms; and cases have been given by Dr Warren,* Mr Money,† and others, in which it appears to have been the sole or the principal means of cure. It is given either in the form of pure opium, or combined with ipecacuan, as in Dover's powder, when from two scruples to a drachm may be given twice daily. If the compound powder disagree, which sometimes happens, a pill containing two grains of opium to three of aromatic confection, should be substituted twice, or, if requisite, three times daily. In one of Dr Warren's cases, ten grains of opium were given four times daily without producing any other effect than pain of the head, sleepiness, and giddiness, and profuse perspiration. Though it does not appear capable of finally curing the disease, it is a powerful auxiliary. Its effects are most conspicuous and permanent when preceded by blood-letting.

The diet of those who labour under diabetic symptoms should be regulated with the utmost attention. It is a mistake,

* Medical Transactions, Vol. iv. p. 188.

† Medico-Chirurgical Transactions, Vol. v. p. 236.

however, to suppose that the morbid ravenousness of diabetic patients should be gratified to the full extent; or that nothing but animal matters, on the principles of extinguishing the sacchariferous action, should be eaten. Though the method of Dr Rollo had the effect of disguising the saccharine matter in the urine by increasing the quantity of urea, it did not alleviate all the symptoms, much less did it cure the disease. It is indeed questionable whether it did not increase the emaciation and wasting, and accelerate in many instances the fatal event. The stomach of diabetic patients is not healthy, nor is their digestion really powerful; and the plan of giving animal and indigestible food in such abundance as the rules of Dr Rollo required, gave a weak stomach, and impaired digestive powers a great deal more to do, than they were able to affect. This method further would never remove the morbid change of the blood.

Instead, therefore, of giving animal food in such abundance, the most proper plan would be to give small portions of mixed food at proper times. It is requisite merely to avoid vegetable substances liable to the acetous fermentation. But bread, rice, and everything farinaceous may be safely taken. Eggs are highly proper; and perhaps oysters might do no harm if taken with dry bread or biscuit. While there are symptoms of pain in the epigastric or lumbar regions, and while the texture of the blood is still unchanged, animal food ought to be avoided; and the patient should endeavour to satisfy his appetite with bread, rice, or other farinaceous matters. When the pain has subsided, and the blood shows a more healthy appearance, animal food in small quantities may be allowed once daily. The thirst is best quenched by beef-tea, veal soup, or toast-water with a little bread and butter. Wine, spirituous and fermented liquors, should be avoided scrupulously.

On the use of such imaginary specifics as hepatized ammonia, nitric acid, &c. it is unnecessary to dwell. They may palliate symptoms, but have no influence on the disease.

CHAPTER V.

Ovarian Dropsy. *Hydrops Ovarii*. *Oaro-cystitis*. *Hydro-oarion*. Chronic Inflammation of the Ovarian or Graafian vesicles.

Anatomical Observations on the Body of a Woman Hydropsical in her left Testicle. By Dr Henry Sampson. Phil. Trans. No. 140, p. 1000. xii. Lond. 1678. (Contained mucilaginous matter like white of egg.)—An Observation concerning a Dropsy in one of the Ovaries of a Woman. By Hans Sloane, M. D. Phil. Trans. No. 252, p. 150. xxi. London, 1699.—Sur la Grosseur enorme d'un Testicule Feminin, Observation xcv. chez Nouveau Recueil d'Observations Chirurgicales, faites par M. Saviard, Ancien Maitre Chirurgien de l'Hotel-Dieu. Paris, 1702. P. 400.—An Account of a Hydrops Ovarii, &c. in a *Puerpera*. Communicated by Dr Douglas. Phil. Trans. No. 308. p. 2317. xxv. London, 1706. (The left ovary distended, so as to fill the whole belly, and its substance attenuated.)—An Account of a Dropsy in the left Ovary of a Woman, aged 58, cured by a large incision (4 inches long) made in the side of the abdomen. By Dr Robert Houston. Phil. Trans. xxxiii. p. 8. Lond. 1726. (9 quarts of a substance thicker than jelly, or like soft glue, extracted.)—A Remarkable Case of a Gentlewoman who died of a *Hydrops Ovarii*, in the 33d year of her age, after having been tapped 57 times. By Mr John Belchier, Surgeon. Phil. Trans. xxxvii. p. 279. London, 1733. (The left ovary much distended; its surface cartilaginous, and containing numerous hydatids.)—A Dropsy and large *Vesicæ* in the Ovarium. By Mr John Paisley, Ed. Med. Essays, v. 766. Edin. 1744.—Four Cases of the Tumefied Ovarium. By Alexander Monro, Professor of Anatomy in the University of Edinburgh. Ibid. v. p. 770.—Observations on Ovarian Dropsy, in the History of an Emphysema. By William Hunter, M. D., in Med. Obs. and Inquiries, ii. ix. p. 41. London, 1762.—Pathological Inquiries and Observations in Surgery, from the Dissection of Morbid Bodies, &c. By Richard Cheston, Surgeon to the Gloucester Infirmary. Gloucester, 1766. 4to. Chapter iv. p. 41.—Alberti V. Haller, *Opuscula Pathologica*. Observatio lii. *Ovarii Scirrhus Maximus*. Apud op. Minora. T. iii. p. 348. Lausannæ, 1768. 4to.—An Extraordinary Case of a Dropsy of the (left) Ovarium, with some Remarks. By Philip Meadows Martineau, Surgeon to the Norfolk and Norwich Hospital. Phil. Trans. lxxiv. p. 435. London, 1784.—A Case of *Hydrops Ovarii* and *Ascites*. By William French, Surgeon, Mem. Med. Society. i. p. 234. London, 1787.—Case of Extraordinary Enlargement of the Abdomen, owing to a Fleшы Encysted Tumour. By R. Pulteney, M. D. &c. Mem. Med. Society. ii. p. 261. London, 1789.—History of a Case of Encysted Dropsy with a Dissection. By Amos Winship of Boston, Massachussets, M. D. Mem. Med. Society, ii. p. 368. London, 1789.—*Selecta Diarii Nosocomii*. R. Frid. Hafniensis, Auctore Frid. Lud. Bang. Hafniæ, 1789. Tome i. p. 296. 12 Nos. *Ovarium enorme scirrhosum*. (*Excrescentiæ in superficie ejusdem (ovarii dextri) variae magnitudinis et indolis, quaedam pugni magnitudine mollis livescens, intus sanguine repletæ, aliæ minores serum gelatinosum vel hydatides includentes, aliæ prorsus duræ scirrhosæ*.)—A Case of Dropsy of the (right) Ovarium; with remarks on the Paracentesis Abdominis. By Mr Edward Ford, Surgeon, &c. Medical Communications, ii. p. 123, London, 1790. (Attach-

ed to the inner surface of the cyst, several large bodies, the size of the egg of an ostrich; others not larger than a walnut; some resembling hydatids, others firmer.)—The History of a Dropsy of the Ovarium, terminating fatally; with an account of the appearances on Dissection. By Cuthbert Johnson, M. D. of Sherborne, Dorset. Medical Commentaries, Vol. vii. p. 91. 1780.—Of an Ovarium (left) in which were contained many extraordinary appearances. In Chirurgical Works of Benjamin Gooch, Surgeon, Vol. iii. p. 132. London, 1792. (The left ovary contained a quart of atheromatous matter enclosing a ball of fat, with much brown hair intermixed with it and two teeth.)—History of a Case of Encysted Dropsy, with an Account of the Appearances on Dissection. By Sayer Walker, M. D. Mem. Med. Society, v. p. 499. London, 1799.—Case of Ovarian Tumour. By Thomas Denman, M. D. Med. and Phys. Journal, ii. p. 20. London, 1779. (Discharge per anum of jelly-like semifluid matter, with streaks of blood; no fæces; with subsidence of tumour and recovery.)—Description of a Remarkable Enlargement of the Ovaria. Communicated by Henry Van der Bosch, M. D. of Wageningen, Med. and Phys. Journal, viii. p. 444. London, 1802. (Uncertain whether a Case of Encephaloma.)—Case of Teeth and Hairs found in the right Ovarium. By James Anderson, Fellow of R. C. S. Edin. Edin. Med. and Surg. Journ. ii. p. 180. Edin. 1806.—Case of a Scirrhus (indurated) Ovary, in which was found an adipose Tumour containing Teeth and Hairs in a patient who died in the fifth month of Pregnancy. By James Millman Coley, Member of R. C. Surgeons, Lond. Edin. Med. and Surgical Journal, vi. p. 50. Edin. 1810.—Observations on Tumours within the Pelvis, occasioning difficult Parturition. By H. Park, Esq. Surgeon at Liverpool. Medico-Chirurg. Trans. ii. p. 296. London, 1811.—History of a Remarkable Case of Ovarian Dropsy. By Thomas Chevalier, Esq. Medico-Chirurg. Trans. iii. p. 40. London, 1812.—A Case of Difficult Parturition occasioned by a Dropsical Ovarium, &c. By Samuel Merriman, M. D. Ibid. p. 47.—Account of a Case in which some preternatural appearances were observed in the Ovarium and Female Bladder. By Edward Phillips, M. D. Andover. Ibid. ix. p. 426. London, 1818.—Cases of Tumour within the Pelvis, impeding Parturition, with Remarks. By Samuel Merriman, M. D. Ibid. x. p. 50. London, 1819.—Account of a Substance obtained from a Diseased Ovarium, &c. By John Bostock, M. D., &c. Ibid. p. 77.—Illustrations of some of the Principal Diseases of the Ovaria, their Symptoms and Treatment, &c. By Edward J. Seymour, M. D., &c. Lond. 1830. 8vo. and Folio. 14 Lithographic Engravings.—Records of Ovarian Tumours. By E. Barlow, M. D. Trans. Med. and Surg. Provincial Association. iv. p. 388. London, 1836.

THIS disease has been by most authors regarded as a variety of abdominal dropsy. But if the mere swelling of the belly be excepted, it has nothing in common with *ascites*. From this, indeed, it differs not only in the kind of texture in which it is seated, in the morbid products which it forms, and in the fluid which gives rise to the swelling, but in the effect which it produces on the constitution and the functions of the living system.

The fluid which constitutes ovarian dropsy is not secreted by a membrane originally serous; for the peritoneum which invests the ovary is not the source of this morbid secretion. The disease appears in three different forms.

First, the ovaries may be converted into a congeries of cysts, which have no communication with each other, varying in size from that of a small pea or a hazel-nut to that of an orange, inclosed by a compact white laminated membrane, and containing either serous fluid with slimy matter intermixed, or a tough ropy jelly, like isinglass, calf-foot jelly, or soft glue. Different cysts in the same ovary may contain different fluid. There is little doubt that these cysts are formed by the gradual enlargement of the small vesicles (*vesiculæ Graafianæ*), which compose the natural structure of the ovaries. They are to be distinguished from hydatids, from which they are entirely different.

Secondly, it is very common for the ovaries to be converted into a number of spheroidal or ovoidal cells, communicating with each other by considerable openings, and containing muddy, serous, or sero-purulent fluid, which distends them prodigiously. A single ovary may be so much enlarged in this manner, as to fill the whole abdominal cavity. The case described by Dr Merriman in the third volume of the Medico-Chirurgical Transactions is perhaps to be referred to this head.

Thirdly, the whole substance of an ovarium may be converted into a thin firm, white capsule, containing fluid capable of partial coagulation. The case described by Mr Chevalier in the third volume of the Medico-Chirurgical Transactions may be placed in this division. It is not easy to explain the process which here takes place within the ovary. Its parenchymatous structure and its vesicles have disappeared, and a watery fluid is substituted in their place. There are three modes only in which this could be affected. *First*, either the outer, that is, the adherent surface of the peritoneal covering becomes inflamed, and secretes serous fluid, which at once distends this covering and compresses greatly, or entirely absorbs the rest of the organ. *Secondly*, the vessels of the parenchymatous and vesicular tissue may have been the agents of the serous inflammation, and produced nearly the same effect. Or, *thirdly*, one vesicle, it may be imagined, assumes from some cause the inflammatory action; its inner surface secretes fluid, which, progressively increasing, produces absorption of the contiguous ones, and finally of the whole substance of the ovary, until it reaches the peritoneal covering; the vesicle, or rather the membrane of the vesicle, then coalescing with this, continues its secreting action, and expands along with the peritoneal

coat till it reaches the inner or free surface of the abdominal peritoneum.

It is not improbable that these different forms of ovarian dropsy are different stages only of the same morbid process. The one first described is, perhaps, the first in appearance, when the cells are still unbroken and without communication; when these communicate with each other, they form the second stage; and, as the communications enlarge, till no trace of vesicular cavities remains, but the diseased organ presents one single cavity, it is then at its most advanced form. According to this view, inflammation commences first in the vesicles, one or more; and as its action is extended, and its products increase, the parenchymatous matter disappears, and the morbid organ consists of its peritoneal covering enclosing the dropsical fluid.

All these and similar forms of disease, I regard as effects, various in duration, of inflammation affecting the ovarian or Graafian vesicles. The inflammation may be acute at the commencement, and become chronic, but is more frequently sub-acute or chronic. The inflammation affects first the inner surface of one or more vesicles, and there gives rise to new morbid products, which cannot be discharged, or escape by any natural aperture; and therefore as the morbid action continues, and the morbid product increases in amount, it necessarily distends and enlarges the vesicle or vesicles in which the action originated.

It may begin either in one vesicle, or in two or more at the same time, or successively. When it begins in one, it enlarges it often to a considerable size, while the others are shrunk and compressed, and the remaining portion of the ovary is shrunk and contracted, the single enlarged vesicle engrossing all the nutriment of the ovary.

The vessels which in the natural state are distributed to the ovarian tissue and the other vesicles, are, by the establishment of the inflammatory process in the diseased one, necessarily defrauded of their natural supply of blood. The parts to which they go, thus dehematized, shrink and undergo a species of atrophy, the rapidity and extent of which are generally in the direct ratio of the anormal or hypertrophic enlargement to which the single morbid vesicle proceeds. In this manner, after a certain lapse of time, the entire ovarian cellular tissue

disappears under a process of starvation, and the vesicles are obliterated or reduced to so small a size, that they can no longer be recognized; while the place of the original structure is usurped by one overgrown cyst, which has derived its excessive size and contents from the spoliation of the others. The process which thus originated in inflammation terminates, as is almost invariably the case, in hypertrophic augmentation, or excessive nutrition; and it is the duty of the practitioner, in contemplating the latter, never to lose sight of the former.

When it affects two or more vesicles, as they are enlarged, the containing sacs which form septa between them almost invariably give way, and two or more vesicular cysts are thus made to communicate with each other. The interior of these cysts emptied of their contents, are in general rough, flocculent, and lined by a sort of jelly-like blood-coloured matter, which is the immediate product of the diseased action in the walls of the enlarged vessels.

The contents of the enlarged ovarian tumour vary in appearance and consistence according to circumstances; and even different cysts in the same enlarged ovary may have different sorts of contents. It may be a dark-brown coffee-coloured liquid; they may be masses of straw-coloured semifluid matter like soft calf-foot jelly, or half-dissolved glue in the form in which it is used for painter's size; they may be like a mixture of oatmeal and water of various degrees of consistence; and then they are generally considered as atheromatous; they may resemble honey of various degrees of consistence, when they are designated by the name of *meliceris*; and they may consist of masses of semifluid fat or lard, fluid when discharged, at the ordinary temperature of the body (97°, 100°), but becoming concrete in the cold; and in this case they are often intermixed with masses of long intertwined hairs, a few teeth, and similar objects. The fatty matter is similar to that of the *steatoma*.

In the three last mentioned varieties, there is not the same clear evidence as in the others, that the products are the effects of the inflammatory process; and these are perhaps to be regarded as a particular species of new morbid secretion.

If any of these secretions be discharged by operation during life, not unusually a purulent or sero-purulent discharge follows for some time.

These changes take place at first so slowly and with so little

pain, that the presence of dropsy or enlargement of the ovary cannot be ascertained in a very early stage. But when the morbid process has advanced so far as to form a swelling at the lower part of the belly, the presence of the disease may commonly be ascertained by an accurate examination and attention to the history of its growth, especially those characters which distinguish it from ascites. Thus the swelling is generally more on one side of the belly than the other, or at least at first was so, according as the right or left ovary is affected. The surface of the swelling is irregular, and the sense of fluctuation is much less distinct than in ascites. Lastly, the general health is much less affected. The patient has rarely either the thirst, heat, scanty urine, or loss of flesh, which attend abdominal dropsy; and it is not uncommon to see women with ovarian dropsy enjoy tolerable health and strength, and retain the natural plumpness of their person, with the single inconvenience of large unwieldy tumour of the belly.

Notwithstanding this trifling influence on the functions, ovarian dropsy rarely admits of cure. Instances have been known of its procuring a passage for the fluid, by adhesion and ulceration, into the Fallopian tubes, or through the rectum. But medicine has little effect on it.

Enlargement of the ovaries with sero-sanguine collections, or other fluid, or semifluid matters, are extremely difficult to be removed. It has been long observed that they are little or in no degree under the influence of remedies; and that all treatment was unsuccessful. One of the principal reasons of this want of success was the practice of regarding the disease as a variety of dropsy, and upon that principle attempting its removal by means of diuretics. Another reason is, that enlargement of the ovary was regarded as a simple lesion or disorder; whereas invariably it is the effect, and sometimes the effects of several simple lesions. It is a very rare circumstance, indeed, that the physician can exercise any control over the effects and products of morbid action.

If the existence of the disorder could be detected in its origin, the great object would be to subdue inflammation before it had given rise to products and organic changes. This must be attempted by blood-letting, general and local, revulsion, by means of rubefacients, epispastics, and exutories, and the other branches of the antiphlogistic regimen.

After this period, I believe it is of little moment what is

done beyond the occasional application of leeches to abate pain and alleviate the sense of distension, with regulation of the diet and attention to the alimentary canal.

The idea of removing the tumour, however, by means of absorption, has suggested the use of iodine; and the remedy should be administered where its use is not contraindicated by the symptoms and by idiosyncrasies. It may be given either in the form of tincture or in that of the ioduretted hydriodate of potass.

Several surgeons, observing the intractable character of ovarian tumours by internal remedies, have proposed to puncture them and empty their contents, or to remove the organized mass by extirpation.

The employment of the first measure has been favoured by the happy result of a few isolated cases; for instance, that by Dr Houston, in which the patient recovered completely and survived fourteen years. Other cases have been less fortunate. Several times I have had occasion, at the urgent importunity of patients, to direct or to perform the operation of puncture; and though in one or two cases, the operation was followed by relief, it required to be repeated, and the patient, as usual, sunk under the disease. Some remarkable examples are recorded of the large quantities of fluid removed, the frequency the operation was performed, and the long time the patient survived. Such are the cases of Lady Page, given by Mead, and Sarah Kippus, given by Mr Martineau.

Extirpation has been practised by Dr Nathan Smith of Connecticut,* Dr Macdowall of Kentucky,† Mr John Lizars, of this city,‡ by Dr Dieffenbach of Berlin, by M. Hevin, and by Dr Ehrhartstein,§ with different degrees of success. The operation is doubtless practicable; but the circumstances which indicate or contraindicate its performance are not specified. Few surgeons have been tempted to follow the example of those who first recommended it.

* Edin. Med. and Surg. Journal, xviii. p. 532. 1822.

† Ibid. xxii. p. 248. 1824.

‡ Ibid.

§ Med Jahrbucher des K. K. Oesterr. Staates. B. ii. St. 2. 1833.

CHAPTER VI.

COMPLEX DISORDERS OF THE NERVOUS SYSTEM.

§. I. Chorea. Dance of St Vitus. Danse de St Guy. *Chorea Sancti Viti*. Scelotyrbe. *Chorea Rotatio*. *Tarantismus*.

Observations on the Utility and Administration of Purgative Medicines in several diseases. By James Hamilton, M.D. &c. Edin. 1805; 7th edit. 1823. Chapter x.—On the Treatment of Chorea St Viti by Purgatives. By John Macmullin, Edin. Med. and Surg. Journal, i. p. 25. Edin. 1805.—Bouteille *Traité de la Chorea or Danse de St Guy*. Paris, 1810.—Observations on the Treatment of Chorea St Viti. [By Henry Reeve, M.D. Edin. Med. and Surg. Journal, viii. p. 312. Edin. 1812.—Cases of Periodical Jactitation or Chorea. By Robert Watt, M.D. Glasgow, Medico-Chirurg. Transac. v. p. 2. Lond. 1813.—History of a Case of Chorea St Viti occurring in an adult, and cured in an unusual manner. By Mr Kinder Wood, Medico-Chirurg. Trans. vii. p. 237. London, 1816.—On the Use of Arsenic in the Cure of Chorea. By Mr Salter, Surgeon, Poole. Ibid. x. p. 218. London, 1819.—Case of Rotatio or Chorea, treated successfully by rubbing tartar emetic into the scalp and along the course of the vertebral column, &c. By Robert Hunter, Surgeon, &c. Glasgow, Edin. Med. and Surg. Journal, xxiii. p. 261. Edin. 1825.—On Chorea, with two cases to illustrate the nature and treatment of that disease. By Thomas Jeffreys, M.D. Liverpool, Ibid. p. 273.—Case of Leaping Ague of Angus-shire. By John Crichton, Surgeon, Dundee, Edin. Med. and Surg. Journal, xxxi. p. 299. Edin. 1829.—On the Use of Hydrocyanic Acid in Chorea. By John Stewart, Surgeon, Kelso, Edin. Med. and Surg. Journal, xxviii. p. 271. Edin. 1837.—Case of Chorea Rotatio. By Dr Daniel Kennedy, Dumbarton, Edin. Med. and Surg. Journal, i. p. 416. Edin. 1838.—History of a Singular Convulsive Disease, affecting five children in one family. By Andrew Dewar, Surgeon, Dunfermline, Edin. Med. and Surg. Journal, lii. p. 87. Edin. 1839.

SEMIOGRAPHY.—THE irregular motions named *Dance of St Vitus* affect the young of both sexes indiscriminately; and those chiefly whose constitution is weak, or whose health and vigour have been impaired by confinement and bad diet. Its most usual period of attack is from the 8th to the 14th year, very rarely after puberty. Hamilton, however, saw it in two young women who were from 16 to 18 years of age; and others, as Watt, Heberden, Mr Kinder Wood, Dr Jeffreys, and Mr Crichton have seen various anomalous forms of the disease at almost every period of life, between 15 and 75. I have seen the disease in a man between 40 and 50 years of age; and in this city a person may often be observed in the streets who has presented choreiform motions for at least twenty years, and who must be nearly 40 years of age.

The approaches of chorea are slow; and in general the convulsive motions which distinguish the disease are preceded by

various symptoms which indicate disordered health and imperfect nutrition. A variable, often a ravenous appetite, a sallow look, foul breath, and constipated state of the bowels, may in most instances be observed previous to their appearance. At the same time the usual vivacity and playfulness of boyhood are lost, the eye is dull, and the countenance is affected with occasional twitches, which are at first ascribed to bad habit or imitation. The belly, though sometimes soft and lank, is more generally swelled and hard.

When the convulsive motions appear, they affect the muscles of the extremities and of the face, those moving the lower jaw, the head, and the trunk of the body, at different times, and with different effects, but so as too often to give the unhappy patient a very ludicrous appearance. Though the limb is at rest the foot may be agitated by incessant motions, turning it alternately outwards and inwards. When the patient attempts to raise the limb, the motion is unsteadily performed, and the whole limb is agitated by irregular involuntary motions; and when he tries to walk, the affected leg, instead of being lifted as usual, is dragged along as if the whole limb were paralytic. In like manner, when voluntary motions are attempted by the muscles of the arm, these motions, instead of being regular and precise, as in the healthy state, consist of involuntary, irregular, and awkward jerks; so that when the patient undertakes to raise his hand to his head, or carry a cup of liquor to the mouth, all his efforts are utterly incapable of directing the wrist and hand to their destination; and it is only after repeated violent jerks and irregular motions that the cup or hand is at length raised to the head. These are the most ordinary forms of the disease; but in some instances in which the muscles of the head and face are affected, the head is incessantly rolled about, and the features are twisted and distorted in a very wild and extravagant manner. There is reason also to believe that some forms of stammering or irregularity in the motions of the muscles of speech depend on the same state affecting these muscles.

When the disease has subsisted for some time under the ordinary form of convulsive motions of the extremities, the eye becomes dull and heavy, the face pale, the countenance vacant and languid, and the memory, sense, and intellect loose their wonted energy. The mind becomes variable and capricious; the emotions irregular and disproportionate to their causes;

and the judgment is either much impaired, or gives place to fatuous stupidity. When this state of the mind is accompanied with the motions of the head and face above noticed, the patient presents all the characters of idiocy.

Though the description now given embraces the most common forms of the disease of St Vitus, yet there are modifications which, though more rarely, yet, from their oddity, have attracted the attention of physicians. Thus in some instances, the motions of the limbs have the effect of causing the patient to run or leap for great distances without stopping. This form of the disease, which is endemic in some parts of Scotland, as Forfarshire, Angus-shire, Orkney and Shetland, has been named the *leaping-ague*, and is propagated by imitation, and affects persons of almost all ages. In other instances, again, the disease is not confined to a particular set of muscles, and affects those not only of the limbs but of the trunk, so as to cause incessant motions of the whole person for weeks, months, or years. This form also affects adults as well as those in early life. Lastly, the convulsive motions may be so constituted as to have the effect of causing an incessant motion of rotation or revolution; but this may be regarded as a mere modification of the last. To this head may be referred the dancing-madness of the middle ages, and the Tarantism of Italy and Sicily.

PATHOLOGY.—Though attempts have been made to explain the nature of this disease by tracing it to its remote causes, the theory of its origin cannot be said to be well understood. The derangement of the alimentary function, which Dr Hamilton generally found to precede its appearance, and accompany its progress, is, doubtless, a circumstance which has considerable influence; and if we knew more of the mode in which this derangement operates in disturbing the motions of the muscular system, it would perhaps be discovered to be more general. It is some objection, however, to the general application of this hypothesis, that several well-marked cases of chorea have been said to take place without being preceded by derangement of the alimentary function. It may be admitted as pretty well established, that there is a certain intimate connection between the state and functions of the alimentary canal, and the vigour, steadiness, regularity, and precision of the motions of the muscular system in general. When the alimentary function is healthy, the muscular motions are steady, precise, and energetic; when it is disordered, they are irregular, tremulous,

and inefficient. We cannot attempt, however, to demonstrate the means by which the connection is maintained; much less is it possible to say that its effects are invariably manifest.

Several circumstances, nevertheless, though only in the way of conjecture, here deserve attention.

When we consider the phenomena of chorea, it seems difficult to doubt that there is in the commencement some morbid state of the spinal chord, its emergent nerves, and its vessels. It may become a question whether the circulation of the chord and its membranes is primarily affected, and then deranges at once the motions and secretions of the alimentary canal, and those of the voluntary muscles; or, whether the alimentary canal being first disordered, and its mucous membrane and the intestinal extremities of the splanchnic nerves being thereby irritated and deranged, this irritation is reflected to the spinal connections of these nerves, and there produces sufficient disorder to affect the motions of the voluntary muscles. That this does take place, clear proof is afforded, both by the phenomena of the disease denominated Pellagra, in which a choreiform affection of the lower extremities terminates in palsy, and also by the phenomena of various forms of spinal irritation. There seem, indeed, in most instances of St Vitus' Dance, to be symptoms in the early stage of more or less disorder in the circulation of the spinal chord and its envelopes; and eventually the same morbid state affects the brain and its investments.

In short, chorea may be considered as a symptom of some irritation of the cerebro-spinal axis; and it may happen sometimes that the irritation originates there, and sometimes in the intestinal tube, and is thence reflected to the cerebro-spinal axis. Of the last action the choreiform symptoms that often arise from the presence of worms afford a good example.

THERAPEUTICS.—The treatment pursued by physicians for the removal of this disease has varied at different periods. Sydenham proposed to cure it by alternate blood-letting and purging. De Haen found electricity beneficial in several cases, and he therefore recommends it strongly. Cullen, again, who found bleeding and other evacuations, unless in plethoric subjects, injurious, was inclined to place great reliance on tonic remedies, to the use of which he found the disease often to yield readily. Lastly, Dr Hamilton, whose long practice afforded him much experience in the nature and management of this disease, found the whole class of tonic medicines to be ineffi-

cient or injurious (130–132,) and was led to trust for the cure of the disease to the repeated and steady exhibition of purgative medicines. As these views have received strong confirmation from the experience of other practitioners,—as the success attending other methods has been incomparably less than this,—as the practice is always safe and necessary, there can be little doubt of the propriety of trusting chiefly to the exhibition of purgative medicines, until the symptoms and effects show that other remedies are requisite.

With this view the first object of the practitioner is to unload the bowels as much as may be of their unusual accumulation, and the second is, to restore the healthy action, and to insure by proper means their regular and periodical evacuation. To effect the first purpose the gentler purgatives in frequent doses are best adapted. The ordinary aloetic pill, either alone or combined with calomel, and followed up by infusion of senna, answers very well at first; but the quantity requisite to be taken is so great, that the practitioner must not be deterred by perceiving no effect from the ordinary doses. Not only three or four of the pills may be requisite to move the bowels, but twelve or fifteen may be taken before they are duly unloaded. It is quite indispensable in administering these remedies for the practitioner to inspect the stools regularly, and to note the quantity and the appearance of the matters discharged. If the aloetic pills alone seem inadequate to the purpose, their power may be augmented by adding a few grains of calomel, or a little gamboge; and their operation may be advantageously succeeded by several doses of the compound powder of jalap, or the compound infusion of senna, or some of the neutral salts, as the Rochelle salts (*Tartras potassæ et sodæ*), or the tasteless salts (*Phosphas sodæ*), in proper solution. The discharges are at first hard and globular, or scybalous, sometimes of an unusually dark colour, and with a very fetid odour. The purgatives should be exhibited till these appearances go off, when the spasmodic motions undergo at the same time a manifest abatement, both in severity and in frequency. The cure at this period may be expedited by the use of such tonic bitters as have a tendency to restore the action of the stomach and intestines. Rhubarb, chamomile, or gentian may be employed in their most convenient forms. A very good form is rhubarb, either alone to the extent of five or six grains morn-

ing and evening, or with a grain of ipecacuan every morning, when its effect is gently but effectually to unload the bowels, and to strengthen the action of the alimentary canal. (Hamilton, Appendix, 131.)

In some instances, however, it is requisite to employ other remedial agents beside cathartics. The bowels may be so torpid that cathartics do not act; or there are symptoms of congestion either of the brain or spinal chord. In such circumstances, it is convenient to apply leeches along the spinal column, or at the nape of the neck. Even it may be requisite to have recourse to blisters or sinapisms applied repeatedly along the course of the spine, either at the cervical or the dorso-lumbar region.

The head should be kept closely shaven, and cold water poured on it from time to time.

Cases of chorea even may take place in which depletion by means of general blood-letting may be requisite. Sydenham, for instance, treated the disease occasionally in this manner; and Joseph Frank is of opinion, that there are cases of inflammatory chorea, that is, cases with symptoms of inflammatory irritation, in the cerebro-spinal system.

The effect of the medical remedies will be greatly increased by attention to the diet, exercise, and clothing of the patient. The food should nourish without oppressing the stomach; and even a few ounces of wine may be allowed with advantage. If the intermissions of the disease after the use of purgatives are such as to allow exercise to be taken, it will be highly useful; and this also is the proper period for the cold bath. Flannel clothing, and care to preserve the feet warm, are highly necessary to the success of the treatment.

Among the mineral tonics the safest, perhaps, are the preparations of iron. The sulphate may be used in pills, the muriate in tincture, or the carbonate in pills or powder, as the discretion of the practitioner or the circumstances of the case shall suggest. The ammoniated muriate, in doses of from three to five grains, twice or three times a day, is a good form of the mineral. But perhaps the most powerful chalybeate is found in the solution of alkaline iron, which in doses of half a drachm or a drachm, three or four times daily, is said to act as a good tonic or antispasmodic.

Arsenic has been used with advantage in certain obstinate

forms of chorea, by Mr Martin, (Medico-Chir. Trans. iv.), Mr Salter, and Dr G. Gregory. (Medico-Chir. Trans. xi.) It is chiefly indicated after the free employment of eccoprotic laxatives, and in those cases in which symptoms of atony seem to maintain the irregular motions; and instances are recorded in which the revulsion induced by the irritation of tartar emetic pustules was required to remove the disease.

Among other remedies supposed to possess antispasmodic powers the principal are the root of valerian and the flowers of the lady-smock (*Cardamine pratensis*.) The former has at all times been much used in the treatment of chorea, and with very various success, appearing in some instances to exert a manifest control over the irregular motions; but at others to be utterly inert. It is in no case, perhaps, desirable to trust to it alone; and it should be given only after or along with purgative medicines. The best form is that of the powder of the root, which should be given in doses of from one to two drachms twice or three times daily. In the exhibition of this drug care should be taken that the specimens selected for use be fully grown, recent, and free from musty smell. The flowers of the lady-smock were warmly recommended by Sir George Baker, who found them useful in chorea, epilepsy, and some other anomalous spasmodic affections. They have little sensible or physiological properties, and certainly have not realized the expectations entertained of them. Like all other remedies of this kind, their operation is exceedingly uncertain, and they are not to be depended on when given alone. The dose is from half a drachm to two drachms of the dried flowers. (Medical Transactions, Vol. i. p. 442.)

Among sedative remedies hydrocyanic acid has acquired considerable reputation in the treatment of choreiform symptoms. Its success in the hands of Mr Stuart, Dr Kennedy, and others is calculated to encourage practitioners in its use. By the latter it was given during the motions. It may be given in doses of six or seven drops, repeated four, five, or six times daily, according to the urgency of the symptoms, and the effects of the agent.

Iodine was used by Dr Manson in the treatment of cases of chorea with a considerable degree of success. It is not easy to specify the class of cases in which it is indicated, and in which it is most likely to be beneficial. It must be chiefly after symptoms of congestion of the cerebro-spinal system and irritation

of the intestinal canal have been removed or abated. The choice of the preparation is of no great moment. Dr Manson employed the tincture and the liquor of the ioduretted hydriodate.

The last remedy to be mentioned for the cure of chorea is that of acupuncture. How this operates it is impossible in the present state of knowledge to tell; and, therefore, impossible to distinguish the kind of cases to which it is applicable. But when the treatment by purgatives, by depletion and counter-irritation, and afterwards by tonic or antispasmodic medicines, has been carried to an extent which appears to be sufficient, it may then be expedient to insert in several points of the extremities, through the muscles, one or more needles at different times, and continue to repeat the operation according to its effects.

The anomalous forms of the disease cannot always be treated successfully by any of the regular methods; and under such circumstances a departure is often expedient and sometimes beneficial. Thus the form of St Vitus' Dance, known in Italy under the name of *Tarantismo*, is alleviated and sometimes removed by the modulated tones of a violin, a guitar, or any other musical instrument. In the case given by Mr Wood a drum was employed.

§. II. Hysterics. Vapours. *Hysteria*, Sauvages; Cullen. *Affectiones Spasmodicæ Vagæ*. *Spasmi Vagi*, Jos. Frank. *Passio Hysterica*. *Isterismo*. Mal de la Mere, La Mere.

Thomæ Willis, *Pathologiæ Cerebri et Nervosi Generis Specimen a quo agitur de Morbis Convulsivis et Scorbuto*, Tractat. de M. Convuls. Cap. X. apud Opera. Amstelaedami, 1682. 4to.—A Treatise of the Hypochondriack and Hysterick Diseases in Three Dialogues. By B. Mandeville, M. D. 2d edit. London, 1730. 8vo.—The English Malady; or a Treatise of Nervous Diseases of all kinds. By George Cheyne, M. D. &c. London, 1733.—Observations on the Nature, Causes, and Cure of those disorders commonly called Nervous, Hypochondriac, or Hysterick. By Robert Whytt, M. D. 1st edit. 1764; 2d, 1765; 3d, 1767. Works, Edinburgh, 1768. P. 525, &c.—*Traité des Nerfs et de leurs Maladies*. Par S. A. D. Tissot. 4 vols. 8vo. Paris, 1778.—*Essays on Hypochondriacal and other Nervous Affections*. By J. Reid, M. D. London, 1816.—On the Utility and Administration of Purgative Medicines. By J. Hamilton, M. D. 1805 and 1823.—A Selection of Cases presenting aggravated and Irregular Forms of Hysteria; and an Analysis of their phenomena. No. 1. Hysterical Ischuria. By Thomas Laycock, House Surgeon to the York C. Hospital. Edin. Med. and Surg. Journal, xlix. p. 78. Edinburgh, 1838. No. 2. Ibid. p. 436, containing Hysterical Hemorrhages and Nervous Affections. No. 2. cont. L. p. 24, and 302, No. 3. LII. p. 43.

THE difficulty of giving a general character of the disease

known by the name of hysterics, is admitted by most nosological as well as practical authors; and this difficulty is justly ascribed to the variety of forms which its symptoms are liable to assume. This difficulty will be diminished, if not removed, by viewing the disease under two forms; the first, chronic, consisting of what may be termed hysterical or nervous symptoms; the second, acute, forming the hysterical fit or paroxysm.

The chronic form of hysteria is attended by an assemblage of symptoms so numerous and variable, that scarcely any set of them can be mentioned as sufficient to distinguish the disease. Thus the patient may have pains or aches in the head, twitchings in the chest or side, pains in the back or belly, or both, and very often cramps or pains in the limbs. In some instances the disease may show itself by an acute piercing pain of one side of the head, generally above one orbit, sometimes affecting the entire half of the head, often so severe as to render the patient unable to bear the light, the sound, or attend to any business, yet without pain on pressure, or quickness of pulse. In other instances, again, the only complaint is a gnawing sense of coldness in some part of the scalp, generally about the top of the head. In some women it appears in the form of slight but frequent involuntary motions of the pectoral muscles, cramp of the intercostals, more or less severe palpitation of the heart, or a painful constriction about the lower circumference of the chest, dependent in all probability on some spasmodic affection of the diaphragm. A symptom not uncommon is a painful constriction or cramp referred to the stomach, and which may be either in that organ, or more probably in the diaphragm and its *crura*. At other times the abdominal muscles are affected with cramp, and are gathered into hard masses with a sense of soreness; or by the irregular motion being communicated to the muscular tunic of the bowels, colicky pains, of more or less severity, are felt.

With these various symptoms, the digestion is impaired. The appetite may be voracious, yet the stomach and bowels are unable to digest the food. Wind moves about the intestines, causing much noise and inconvenience. Qualms of sickness come on amidst the most perfect apparent health, and terminate in eructations of wind; and upon some rare occasions, vomiting or even purging may take place. The mind is at the same time fretful, despondent, variable, and easily

alarmed; and the sleep is bad, or disturbed with nightmare and frightful dreams. When several of these symptoms concur in a female between the age of fifteen or eighteen and forty, little doubt can be entertained that she is hysterical. They constitute the predisposition to the disease, and rarely exist long or in any degree of severity without giving rise to the acute form, or an actual fit of hysterics.

This may come on suddenly and without warning, but is more commonly preceded by certain premonitory symptoms. The stomach, for instance, may be affected with faint qualms and retching; the lungs with oppressive and difficult breathing or dry cough; the heart with palpitation; and a large flow of pale limpid urine escapes from the kidneys. These feelings are generally followed by some pain and fulness in the left side and lower part of the belly, in which a ball seems to be formed, and with a grumbling noise to ascend, traverse the cavity by various turns and windings, till it reaches the stomach and top of the œsophagus, where it seems to remain some time, and gives rise to an insupportable and threatening sense of suffocation. If the throat be examined at this time, the whole larynx is found to be spasmodically drawn upwards. After this the patient falls down in a state of insensibility, and the muscles are thrown into convulsive motions, by reason of which the body is writhed to and fro, the limbs are agitated, and the whole frame is more or less violently contorted. The most usual motion of the arm is that of beating violently and repeatedly with the clenched fist on the breast; the legs are alternately forcibly drawn up to the belly and thrown from it; and the abdominal muscles are drawn towards the spine into hard clustered lumps.

After this state has continued for some time it is followed by a sort of drowsy quietude, which has been thought to be sleep, but which is rather a slight coma or lethargy. From this the patient at length awakes sobbing and sighing, and with a murmuring noise through the belly, but without any distinct recollection of what happened during the fit.

Though these form the most usual phenomena of the hysterical fit, they are liable to variation in severity, in kind, and in duration. The most ordinary variation in kind is, that, instead of complete loss of sense during the paroxysm, the patient laughs, cries, and screams, without apparent cause, and, through

various false imaginations, is led to speak and act with a degree of temporary derangement.

These complaints have been supposed peculiar to the female sex; but though they are both most common and most severe in women, they are also observed more rarely and in a slighter degree in man. (Cullen, Ferriar, Hamilton.) In the female sex, the disease may occur at any time between the age of puberty and thirty-five or forty; but it is observed to take place most generally about the period of the menstrual flux. The hysterical disease is most commonly observed to affect women of plethoric sanguine habits, accustomed to full living and indolent modes of life, and sometimes those of robust or masculine constitution. It affects unmarried women more than the married, among the former widows more than virgins, and among the latter barren more than breeding women. In females condemned to celibacy during life, as in the nunneries in Catholic countries, it appears to be complicated with a degree of nymphomania. (Sauvages, Class iv. xx. spec. 6.)

In females presenting the chronic hysterical symptoms, it is further observed, that the menstrual function is often disordered. The preliminary symptoms are painful, oppressive, and enfeebling; the secretion is scanty, and does not continue the usual time; and in its intervals, there is commonly more or less opaque whitish discharge or leucorrhœa. In several of the same class of cases also, there is gnawing pain in the dorso-lumbar region; and when the uterus is examined, the orifice is found to be tumid and painful.

It is also observed that, in the same circumstances, pain in various parts of the spine is felt, and is much aggravated towards the period of the approach of the menstrual function.

In persons disposed to the disease, the paroxysm is in general first induced, and is readily reproduced by some mental emotion, or passion, as surprise, disappointment, or the like. In women of weak mind, hysterical fits may often be traced to a slight received from some of the other sex or some similar disappointment.

Hysteria is to be distinguished from hypochondriasis, from apoplexy, from fainting (*syncope*), and from epilepsy. From catalepsy it is more difficult to distinguish it, as that may be regarded as one of its symptoms.

PATHOLOGY.—The pathology of hysteria is obscure; and even the view given by Cullen is liable to several weighty ob-

jections. His doctrine of a peculiar mobility of the system, (1522), that is, of the muscular fibres, is, however, strongly confirmed by the phenomena of chronic hysteria, or the symptoms of predisposition. He is also in the right in regarding the sensation called *globus hystericus* as a spasmodic affection of the alimentary canal, and especially of the œsophagus. But he fails entirely in connecting this with the genital organs, and in supposing it to be communicated to the brain. (1520). The opinion of Dr Hamilton, that hysteria consists in a preternatural affection of the stomach and alimentary canal, is certainly entitled to some consideration, both from the state of these organs in hysteric patients, and from the influence which they produce on the phenomena of the disease. There is no reason, however, to think that this is the primary cause of the symptoms; otherwise, in every person in whom these parts are so disordered, hysteria might be expected to take place. Disorder of the alimentary canal may contribute, by favouring plethora, to form this, as it does many other diseases; but no disorder of the functions of this part is alone adequate to produce the convulsive motions, the sopor, the delirium, and the other spasmodic and nervous phenomena of hysteria.

It is more probable that the generating cause of the hysteric motions is seated in the brain; and that the spasmodic motions which appear to usher in the fit are the immediate effect of this. What this state of the brain may be, I feel unable to say; but its existence may be justly inferred from the loss of sensibility and voluntary motion, the delirium, the fits of foolish and causeless laughing and crying, the entire loss of recollection, and the temporary derangement with which the paroxysm is very often attended, and lastly, from the fact of the fit being either much alleviated and shortened, or entirely stopped, by the prompt and energetic application of cold water to the head.

Having established this fact of a peculiar morbid state of the brain, of its circulation, or of some of its parts, it may be inferred that it is much more natural to think that the influence of it is to extend to the alimentary canal, and the voluntary muscles, than to imagine, as Cullen did, that the spasmodic motions of the alimentary canal are afterwards communicated to the brain. To this mistaken view he appears to have been led, by the circumstances of sensation and voluntary motion ceasing only when the ball reached the throat; but it is to be

remarked ;—1. That the ball is often felt in the throat, without being followed by cessation of sense and motion ; 2. Various circumstances show that loss of sense and motion takes place, without the sense of the ball being felt ; and 3. It may be shown, that, when the ball or spasmodic affection of the gullet precedes the loss of sense and motion, its presence is preceded by a previous change in the brain, which was to terminate at once in loss of sense and motion, in spasmodic contractions, and in irregular motions of the voluntary muscles. These facts lead to the conclusion, that, in whatever manner disorder of the alimentary canal operates, the primary cause of hysteria consists in a peculiar temporary state of the brain, or of its circulation, in consequence of which its ordinary influence over the organs of sensation and motion is partly suspended, partly deranged, so long as this state continues, and in consequence of which sensation and motion may either be extinguished so as to produce sopor and the adynamic state, sometimes with convulsions, or so much disordered as to cause erroneous impressions and delirium. Several facts lead to the idea, that the cerebellum is the principal seat of disorder during the hysteric paroxysm.

The chronic form of the disorder, with its anomalous and wandering painful sensations, Dr Addison and Mr Tate consider as dependent on derangement in the pneumogastric nerve, the intercostal nerve, the splanchnic nerve, and their branches.

THERAPEUTICS.—The treatment of hysteria differs according as it applies to the disposition and chronic state, or to the presence of an actual fit.

The chronic form of the disease is most successfully treated by the exhibition of purgative medicines, so as to restore the regular and healthy action of the alimentary canal ; by regulation of the diet ; and by the employment of those means which obviate plethora, especially in the vessels of the head, and remove the nervous disposition.

In addition to the employment of purgatives these means consist in the observance of temperance in the use of food and drink,—especially abstaining from the use of wine, spirits, and malt liquors,—in employing regular exercise, and by the use of the shower-bath, or, if that is inconvenient or unattainable, by shaving the scalp, and washing it daily with cold water.

Tonics, as bark, bitters, and chalybeates, have been much recommended, and are still regarded as fashionable remedies. Unaided by the means above specified, their influence is so trifling,

that they may safely be pronounced to be useless ; and if these means are employed, they may be dispensed with. If it is thought requisite, the remedies already mentioned under the head of Dyspepsia may be administered.

In all cases inquiry should be made into the state of the uterine periodical secretion ; and if it be found to be in a morbid state, means ought to be adopted to rectify it. In cases of suppression, tonics and chalybeates are indicated ; and if there be proof of chronic inflammation of the orifice of the womb, means to subdue that should be adopted. Blood should be drawn from the *os uteri* or the vagina by means of leeches.

For the treatment of the fit, a great number of remedies of the sedative, stimulant, or antispasmodic kind have been recommended by various authorities. Thus opium and its preparations were strongly recommended as infallible anti-hysterics by Home (Clin. Exp. 200,) but justly denounced as injurious by Cullen (Mat. Med. ii. 251 and 358). By many, camphor has been reported to be beneficial. (Cullen 299). Sydenham appears to have trusted much to castor with oil of amber ; and Whytt to the same substance with opium ; while with others musk has been in great repute. In Germany the animal oil of Dippel was much employed, and the practice was more or less extensively imitated in other countries. In France a more elegant remedy of composition and powers not dissimilar, was found in the Eau de Luce (*Spiritus Ammoniae Succinatus*) ; and either this or the ammoniated tincture of valerian may be used with the same hopes of success in cases either of hysterical headach or actual fits. The most powerful anti-hysterics, however, have been generally believed to be found in the preparations of the fetid gums, as ammoniacum, galbanum, opopanax, sagapenum, and assafoetida. The last is the one chiefly now in use ; and where there is no idiosyncrasy from the peculiarity of its odour, it may be recommended as a general remedy, possessing and representing the virtues of these substances in general. The proper form for its exhibition during the fit is the spirituous or the volatile tincture, (*Tinctura Ferulae Assafoetida* ; *Alcohol ammoniatum fœtidum*), in the usual doses (20 to 30 drops), or injected in watery solution, with some turpentine, into the intestines. It is also applied externally in the form of plaster to the stomach or umbilical region ; but the effect of this on the hysteric paroxysm is inferior to that of exhibition by the mouth or rectum. Ether is another substance of supposed antispas-

modic powers, very often exhibited in hysteria. It is given either alone, or with castor, musk, or assafoetida; but its influence is neither great nor uniform; and its employment is liable to lead to bad habits.

It is very doubtful whether any of these means have the effect of shortening the duration, or weakening the force of the fit. For it is known that the hysteric paroxysm has a tendency, after going through a certain course, to terminate in a certain mode and at a particular time. It hence results, that in fits of ordinary severity, which are treated with the usual antispasmodics, these remedies seem to be efficacious; while in severe fits, in which, though their influence is doubtless equally great, they exercise no beneficial influence whatever. There is, however, one remedy which truly appears to possess the power of shortening the hysterical paroxysm, and recalling the patient more quickly to her senses than any other. I allude to the application of cold to the head, by means of a towel immersed in cold water, and applied round the forehead, temples, and hind-head. As soon as the cold appears to be diminished by the heat of the head, the application should be renewed by means of a fresh towel immersed in water in the same manner; and it may be repeated as often as seems requisite till the patient appears to recover her senses. I have never seen any harm from this application; and it has always in my hands put a speedy termination to the fit. When it appears inadequate, the cold affusion should be employed.

Blood-letting was tried by Home, and has been a good deal used in hysterical cases with various effect. I have seen it prove successful after other means had failed; and, I have little hesitation in saying, that it does not aggravate the disease, as has been too often asserted, but may often be requisite after purgatives, and other means have been used without success. It is indicated when the patient is plethoric, the head hot and painful, and when there is much delirium. If general blood-letting be thought unsafe, the blood may be drawn from the head, either by opening the temporal artery, or by applying leeches to the temples, or cupping-glasses to the nape of the neck.

A remedy of some power has been thought to be found in immersion of the feet in warm water. It may always be proper to try its effect; but it will often be found to be of little moment; and the violent motions of the patient, almost invariably prevent it from being employed with any degree of certainty or exactness.

§. III. Trance or Catalepsy. *Catalepsis. Stupor Vigilans, Fernel. Extasis. Extasy.*

CULLEN states that he never saw catalepsy unless when counterfeited (Nosolog. Gen. xlii. 8.); and he expresses his belief, that what others had seen and described was counterfeited also. This may be true with regard to several of the cases described as catalepsy by authors; but cannot, perhaps, be said of all the cases, without denying all faith in human testimony, and all capacity of observation. Thus, independent of the cases referred to by Sauvages, instances of cataleptic seizure and symptoms have been described by Lamberger, (Dissert. de Puellæ Catalepticæ Historia et Sanatione. Lug. Bat. 1776.); Schilling, (Dissert. Giessæ, 1776.); Heberden, (Comm. cap. lxi. p. 307.); Lubbock, (Edin. Med. and Surg. Journ. i. p. 61); Cheyne, (Cases of Apoplexy and Lethargy, Lond. 1812, p. 184.); Joseph Frank, (Praxis Med. Part ii. Vol. ii. Cap. xiv.); and other competent observers. I have seen also a species of cataleptic fixing of the muscles and senses in a person labouring under partial mental derangement.

It is remarkable that most of these cases occurred in females; that many of them occurred in females, either young or of middle age, unmarried or widows; that in several it was possible to trace a connection between the womb or its periodical discharge, and the appearance of the cataleptic symptoms; and that when it occurred in elderly women it was in those who, in early life, had been hysterical. These reasons induce me to consider catalepsy, as described by authors, if not an hysterical affection, at least a nervous disorder or symptom rather, very closely allied to hysteria. In short, many of the anomalous cases of hysterical fainting, as they are termed, may be justly referred to the head of catalepsy; and all cases of cataleptic seizure may be regarded as symptoms of hysteria. With regard to the few cases said to have occurred in the male sex, they cannot afford any material objection, since their subjects were of the weak nervous description, in whom hysterical symptoms have been remarked sometimes to take place.

The cataleptic attack is said to come on suddenly, though it is generally preceded by languor of body and weakness of mind. The members suddenly become fixed and motionless; the senses are suspended; and consciousness, memory, and judgment are for the time gone. But though the patient has no power in moving the limbs, they may be moved by another,

but remain in the same position in which they are placed. This may continue for some minutes, one hour, or for days, according to some authors. When it continues a short time, it is liable to recur in the form of frequent fits.

A minor degree of cataleptic seizure is said to occur in the form of mere affection of the muscular system, the organs of sensation and the intellectual functions remaining unimpaired.

No satisfactory explanation of the cause of this suspension of the powers of mind, sensation, and voluntary motion has yet been given. Indeed, the facts hitherto collected are too few and too inaccurate to warrant any positive conclusions regarding their origin or formation.

The remote causes of the disease are not very well known; but, in general, they seem to be much the same as those of nervous diseases, especially hysteria. The most common exciting cause is fright or panic.

Nothing is ascertained regarding the best mode of treating this disorder. During the fit, perhaps it may be advisable to employ the same treatment as in the hysteric paroxysm; and in the intervals, the attention of the practitioner should be directed to strengthen the nervous system, by diminishing plethora, and removing morbid sensibility. Acupuncture seems to be a remedy not altogether unsuited to the permanent removal of cataleptic symptoms. Electro-magnetism should also be employed.

The peculiar state termed *Extasy* seems so closely allied to catalepsy, that it may without much impropriety be regarded as a variety of it. It consists not so much, however, in loss of corporeal functions and powers, as in the forcible, sudden, and active occupation of all the mental energies upon some object or objects that operate strongly on the feelings; and in the consequent suspension of all corporeal functions, unless those which are necessary to this occupation of the mental faculties. Its occurrence is chiefly confined to those of enthusiastic temperament, and whose minds have been much and intensely occupied on any subject which powerfully interests their imagination and feelings.

It is more a subject of consideration to the physiologist and metaphysician than to the medical practitioner, both in its nature and management. Darwin, Prichard, (Chapter xi., section 2d,) and Joseph Frank, (Praxis Med. Part ii. Vol. ii. Cap. xiii.) may be consulted.

§. IV. Epilepsy. Falling Sickness. *Morbus Comitialis*. *Morbus qui sputatur*, Plautus. *M. Divinus Hieranosos*. *ἱερανοσος*. *Epilepsia*; *Eclampsia*. Epilepsie; Mal-caduc; Mal de la Terre; Mal de S. Jean. Haut-mal. Die Fallende sucht; Jammer; Schwere Noth; Boses Wesen; Bose Staupe.

Traité des Mouvemens sympathiques avec explication des ceux, qui anivert dans le vertige, l'épilepsie, l'affection hypochondriaque et la passion hysterique. Par Pierre Brisseau. Montpellier, 1692.—Traité de l'Epilepsie avec sa description, ses differences. 12mo, ses causes, &c. Par Pierre Brescon. Bourdeaux, 1742.—Cases of the Epilepsy, Hysteric Fits, and St Vitus's Dance, with the process of cure; to which are added Cases of the Bite of a Mad Dog, and a method that has been found successful. 2d edition. By John Andree, M.D., C. Phys. London. London, 1753.—Essay on Epilepsy. By W. Threlfal, M.D. London, 1778. 8vo.—Traité des Nerfs et de leurs Maladies. Par M. Tissot. Paris, 1778-80.—Diaetophilus, Physische und Psychologische Geschichte seiner siebenjährigen Epilepsie, &c. Zurich, 1798. 8vo. Goetting. Anzeiger, 1798. p. 1611.—De l'Epilepsie en generale et particulièrement de celle déterminée par les causes morales, &c. Par Doussin Dubreuil. Paris, An. v. 1796.—Recherches et Observations sur l'Epilepsie. Par M. Maissonneuve. Paris, 1800.—Observations sur le Traitement de l'Epilepsie. Par Antoine Portal, Prof. Memoires sur plusieurs Maladies, Tome ii. p. 229. Paris, An ix. 1800.—On Epilepsy, and the use of the *Viscus Quercinus* or Mistletoe of the Oak in the cure of that disease. By Henry Fraser, M.D. 8vo. pp. 96. London, 1806.—On the Use of Oil of Turpentine, &c. in Epilepsy. By Edward Percival, M. B. Dublin. Edin. Med. and Surg. Journal, ix. p. 271. Edin. 1813.—A Treatise on Diseases of the Nervous System. Part I. comprising convulsive and maniacal affections. By J. C. Prichard, M.D. &c. London, 1822. Chapter iii.—A Treatise on Nervous Diseases. By John Cooke, M.D. Vol. ii. Part II. History and Cure of Epilepsy. London, 1823.

EPILEPSY may be said to consist in paroxysms or fits of loss of consciousness, of sensation, and of voluntary motion, with more or less convulsion, terminating in coma and stupor.

Though epilepsy sometimes comes on suddenly, it is often preceded by some premonitory symptoms. The most frequent of these are languor, dulness, or drowsiness, headach, giddiness, dimness of sight, ringing in the ears, or other disorders of sensation. Ocular spectra, or prismatic colours are sometimes seen; peculiar odours are felt; the patient may be restless or fretful; and even some slight mental derangement may precede the attack for a few hours. The most remarkable previous symptom, however, is that of a cool air breathing gently on some part of the extremities, and rising generally to the head, (*aura epileptica*), or of a cold stream, or a sense of pricking like insects creeping, (*formicatio*.)

After one or other of these sensations, the patient falls suddenly to the ground with a loud scream or shriek, and remains

without consciousness, sensation, or voluntary motion, during the fit. At first the muscles seem to be perfectly inactive; but they are very quickly thrown into involuntary motions more or less violent. The thumbs and fingers are forcibly bent into the palms; the fist is violently clenched; the features are distorted; the eyes forcibly drawn up so as to show the white only; the tongue is convulsively thrust through the teeth; and as the muscles of the lower jaw are also much agitated, it is often bitten, or lacerated during the violence of the paroxysm. The limbs are also agitated by convulsive motions of their muscles, sometimes more violently on one side than on the other, sometimes with more or less spastic stiffness. At the same time the heart palpitates, the carotids throb strongly, the pulse is quick, sometimes irregular, and the breathing is hurried and panting.

The more or less general prevalence, and the severity of these convulsive motions produce several remarkable phenomena in the fluids of secretion or excretion. Thus the violent and incessant motion of the muscles of the lower jaw and mouth causes an abundant discharge of frothy saliva or foam; the feces and urine are sometimes discharged, and the semen emitted. When these motions have continued for some instants or minutes, their severity abates; and gradually going off, they are succeeded by a state of tranquillity and seeming sleep. After some short time the patient sometimes suddenly, but more frequently gradually comes out of this state, and at length recovers his senses and power of motion, but without any recollection of what had happened during the continuance of the fit. He still, however, complains of a sense of soreness in the limbs, languor, and weariness; he may feel squeamish and vomit; the head is heavy, and giddy, or even aches; and he has more or less stupidity or want of his usual acuteness. The pulse and respiration, which during the fit are more or less hurried and irregular, still continue somewhat quicker than natural, and only after some time return to their natural standard.

These form the chief circumstances of the epileptic fit. The duration of these fits varies in different individuals. They may be so short as occupy a few seconds only; more frequently they last for a quarter of an hour, twenty minutes, or half an hour; and even for three hours on some rare occasions. (Herberden.) Barbette states that he knew a girl of twenty years of age, in whom they always lasted for fourteen hours; and

Heberden mentions a man who lay almost lifeless for three days, with frequent convulsions, and yet recovered.

The intervals between the paroxysms are subject to no certain law. In some few recorded instances, they are said to have recurred every day, every week, every month, or at each period of new and full moon, or at each spring or autumn ; but from these facts no general conclusion can be derived. When the paroxysms are mild, according to Heberden, they generally return several times in the same day ; and Van Swieten states that he has seen many epileptic persons who suffered several fits in the course of twenty-four hours. In one instance mentioned by Heberden, no fit had appeared for a space of thirteen years, after which it returned more frequently, and in a more severe form than before. The return of the fits seems occasionally to depend on some strong and sudden mental emotion, as fear, alarm, surprise, &c.

The time within which the patient recovers the full exercise of his mental faculties varies in different individuals. In some so little change takes place that they can scarcely believe that they have been unwell. In others, and by far the greater number, with the headach, languor, and general soreness, there are conjoined some loss of memory and inaccuracy of judgment ; and the space which this dulness of the faculties continues may vary from one to several hours. Heberden states that the mind and recollection may scarcely be restored within three days.

Epilepsy may terminate in health, in apoplexy, in palsy, or in idiocy, and complete mental imbecility.

It is stated among authors that epilepsy, when it commences in childhood, generally disappears about puberty ; but, according to the experience of Heberden, this is not well founded. But whether it is prolonged or takes place after this period, it may, under proper management, or by some favourable revolution in the system, leave the patient entirely.

The termination in apoplexy or palsy is not uncommon when the disease is long continued, and the fits frequently repeated. It may be apprehended where there are symptoms either of local or general plethora ; where more or less pain of the head and fits of giddiness indicate some chronic disease of the brain ; and where the epileptic fits have recurred so frequently and so obstinately as to indicate their dependence on organic change in the scull, the membranes, or the brain itself.

The termination in idiocy is perhaps the most frequent after the disease has continued any time unabated in frequency and severity. The memory becomes first impaired, and the individual begins to err in judgment in consequence. Afterwards, the recollection seems entirely gone, or is awakened only at few and remote intervals; apprehension and imagination gradually fail; the reason ceases to be exercised even on the most trivial points; and all the mental faculties, except mere momentary perception, seem to be utterly extinct. The countenance at the same time becomes dull, vacant, and devoid of expression; and the unhappy person presents the usual marks of entire idiocy.

In the most favourable cases, epileptics have a variable and difficult character. The memory is treacherous; and they can pursue no object with attention and perseverance. They are easily excited; very irascible, and liable to break into fits of ungovernable fury, and outrageous violence. Some are idiots. Almost all terminate, if they live long enough, by falling into a state first of variable mania, then of incurable madness, and lastly, of drivelling imbecility. Among 289 epileptics in the Salpêtrière in 1813, M. Esquirol found 80 maniacs, and 56 idiots, imbeciles, or fatuous,—in all 136. From another survey taken in 1822 by the same author, among 339 epileptics, 2 had monomania, 64 were maniacs, of which 34 furiously so, 145 insane, of which 129 were so after the attack only, and the other 16 constantly so, 8 were idiots, 50 habitually reasonable, but with occasional loss of memory, exalted ideas, sometimes temporary delirium, and tendency to fatuity; 60 presented no aberration of intellect; but they were very susceptible, irascible, headstrong, capricious, whimsical.

Though epilepsy may attack both sexes and all ages, early life, however, is most liable to suffer; and though, at this time, both sexes appear to be indiscriminately affected with its attacks, it is afterwards more common in men than in women. Again, though it appears most commonly during the period of childhood or youth, neither adult age nor advanced life are quite exempt from its attacks. Heberden met with examples in which persons had become epileptic at every time between the 20th and the 50th year. In a few the disease had appeared at the 60th; and in one case, the individual became epileptic in his 75th year, and had annual fits for six or seven years, or even to death. Morgagni also mentions instances of per-

sons becoming epileptic at the 40th, 58th, and 68th. I have had under my care during the last winter a man who became epileptic in his 65th year.

The pathology of epilepsy is involved in great obscurity ; and though numerous dissections have been made by Morgagni, Lieutaud, Greding, Wenzel, Esquirol, and others, it cannot be said that they lead to any satisfactory result. In the dissections of Morgagni and Lieutaud, various morbid changes of the brain, its membranes, or the skull were recognized. Preternatural hardness or softness of the brain, serous fluid in the ventricles, effusion of blood or purulent matter in the substance or on the surface of the organ, adipose, hard, or bony tumours, unusual number and distension of its vessels, or of those of the membranes, cartilaginous, or osseous, or calcareous induration of one or more of them, and malformation of the skull itself, are all enumerated as results of the dissection of epileptic subjects. In 8 epileptics, Greding found the brain, and in 25 the pineal gland unnaturally soft, and in 20 the latter part immersed in serous fluid. Wenzel, again, though he always found some change either of great hardness, great softness, or diminished size in that minute body, met, however, the most frequent morbid changes in the pituitary gland, and in the cerebellum. Among 25 subjects, the former was enlarged in 7 cases ; yellowish, solid, and pulverulent in 10, and contained a turbid viscid fluid in 5 ; while its upper surface often showed marks of inflammation. The cerebellum was softened or hardened, diminished or enlarged, affected with suppuration, excavation, or erosion, or otherwise injured. Lastly, M. Esquirol found in 8 cases taken at random, softening, ulceration, or suppuration of some part of the spinal chord, and cartilaginous or osseous patches in its arachnoid membrane ; and, therefore, is willing to admit some connection between these changes and the epileptic symptoms.

To all the conclusions suggested by these dissections, however, the same answer may be given. Similar changes to each of those above-mentioned have been known to take place without causing epilepsy ; and conversely, epilepsy has been known to take place where neither of these changes, separately or conjointly, have been observed. Cases of this kind, in short, show, that various changes in the brain, cerebellum, spinal chord, or their membranous coverings, may, in their course, give rise to epileptic symptoms ; but that they by no means do

so invariably. Several of these changes also may be the result not of the epileptic action, but of the morbid state of the brain, cerebellum, or its membranes, which causes the epileptic paroxysms; and this appears to be the only mode of explaining the fact, that these changes are not unfrequently observed in a very complete form, yet without having produced, during life, the most temporary epileptic attack. These considerations demonstrate not only the fallacy of former hypotheses of epilepsy, but the extreme difficulty of giving any consistent or satisfactory explanation of the phenomena of the disease. When, in short, it is remembered, that any theory which should explain it fully, would require to prove a peculiar morbid state of the brain sufficient to induce a temporary suspension of intellect, consciousness, and sensation, and a temporary interruption of the control exercised by the will and nervous system over the muscles, the difficulty of forming a correct theory, comprehending all the possible cases of the disease, must be obvious. The admission of such a morbid state of the brain of some particular part as a cause of epilepsy is not so difficult as that of its temporary effects on the intellect, sensation, and voluntary motion. For if this be admitted, why are these effects not more permanent, and how is it to be explained that the individual enjoys, during the intervals, pretty perfect health both of body and mind?

In enumerating the remote causes of epilepsy, a distinction must be made between those epileptic fits which appear for the first time, or occur in the course of manifest disease or injury of the brain, and those which occur in persons who have already laboured under the disease for some time.

In the first case, the fits may generally be traced to some agent or agents which act as irritants of the nervous system. Thus in infants, dentition and disorder of the stomach or bowels, worms in the latter; in women, pregnancy, the process of parturition, sometimes that of menstruation; in persons of both sexes and all ages, injuries of the head, depressions of the skull, inflammation of the brain or its membranes, softening of the brain, or hemorrhagic congestion; profuse hemorrhages, spontaneous or artificial; severe and painful operations; the irritation resulting from cutaneous inflammation previous to eruption, or afterwards repelled, (*eclampsia et epilepsia exanthematica*,) as in small-pox, measles, scarlet-fever, or repelled itch; and various vegetable or mineral substances taken

into the system, (*eclampsia ab atropa, ænanthe, cicuta, coriaria, et lauro-ceraso*,) (lead, Pemberton,) may give rise to epilepsy, which, however, disappears without recurring when these causes have ceased to operate. Thus the *eclampsia a dentitione, a saburra, e. verminosa, Neophytorum, parturientium*, and the *epilepsia uterina* occur only during dentition, disorder of the bowels, worms, pregnancy, in parturition or menstruation, and disappear as soon as this temporary cause is removed. In the same manner the traumatic epilepsy, (*epilepsia et eclampsia traumatica*,) the hemorrhagic, (*eclampsia ab inanitione*), that from severe bodily pain, (*epilepsia, eclampsia a doloribus*), and that occurring in the course of small-pox, &c. depend on the hemorrhage, severe pain, and violent irritation respectively, and cease as those conditions go off. The convulsions also which result from the internal use of nightshade, dropwort, hemlock, sumach, and the cherry-laurel water, are of the same description. Epileptic fits occurring under such circumstances depend, doubtless, on a peculiar state of the brain or its circulation; but this, again, is produced by the influence of another agent.

The fits which occur habitually and periodically are to be viewed in a very different light. Connected with a peculiar state of the brain, at all times more or less marked by certain circumstances, they may be brought on by the application of any of those agents which operate as stimulants either of the general circulation or of that in the brain. These may be arranged in the following order:—

Physical causes.—The heat of a crowded apartment; surfeit, or the stimulus resulting from excessive food or drink; a fit of intoxication; tickling; night-watching; atmospheric changes, especially exposure to great cold or great heat; peculiar odours. To the same head I would refer those epileptic attacks which arise from the irritation of a nerve or nervous trunk or branch, a tumour or tubercle in or upon a nerve, and all similar agents.

Moral causes.—Intense or long-continued mental effort; various emotions, as desire, hope, terror, suspense, &c.; a fit of anger.

Mixed causes.—The sexual act; the principle of imitation.

When the disease has been once induced, the fits may be easily excited by any one of these causes; and attention to prevent their operation constitutes a principal part of the curative treatment.

Epilepsy is to be distinguished from apoplexy, from hysteria, from swooning, and from feigned or counterfeited epilepsy.

THERAPEUTICS.—What has been said on the pathology of epilepsy is very applicable to the treatment. As the former is obscure and hypothetical, the latter has been too often irregular, partial, empirical, and unsuccessful, or at least uncertain in its result. Omitting the ages of superstition, when the raspings of the human skull, or the thigh-bone of a strangled felon, the blood of a person cut off by violent death, the precious jewel supposed to lurk in the head of the venomous and ugly toad, the mistletoe, plucked in the wane of the moon, and a multitude of frivolous and absurd observances, were deemed sure and effectual remedies for falling sickness;—even the modern days of science and reason have been more distinguished by the number and variety, than by the selection and efficacy of their remedies. According to the theoretical views of different physicians, different methods of treatment and different remedies have been employed. Thus blood-letting to a greater or less extent, or repeated, if requisite, with antiphlogistic measures, in general, has been employed, with the view of removing plethora, and obviating determination to the brain. Vomiting, or purging, or both, have been recommended to remove gastric and intestinal irritation. While the spasmodic phenomena of the disease suggested the use of such antispasmodics as valerian, ladies-smock, musk, castor, and assæfœtida, the irritative and excitable state of the system was supposed to demand the sedative influence of such narcotics as opium, henbane, thorn-apple, and foxglove. The notion of debility and irritability, or mobility of fibre, suggested from among the vegetable tonics, Peruvian bark, mistletoe, and orange-leaves; and preparations of silver, zinc, copper, lead, arsenic, and quicksilver among the metals. Lastly, upon some obscure idea of defective stimulus to the nervous system, such excitants as cajeput-oil, oil of turpentine, electricity, galvanism, and even phosphorus have been recommended as remedies for epilepsy.

None of all these plans of treatment, and no one of these various remedies, has been always or even generally successful; and it is unnecessary to enter minutely into the consideration of the comparative merits of means, which have been followed with a favourable result in so small a number of cases, that it is impossible to distinguish the circumstances on which their essential operation depends. A more useful ser-

vice will be to specify, from the results of experience, the means most likely to be attended with benefit, and to generalize, as far as possible, the only certain facts which experience has furnished on this head.

It is, in the *first* place, well established, that, in relation to treatment, all epilepsies may be divided into those which are, and those which are not susceptible of cure. It is always difficult to say, where there are not clear symptoms of organic disease of the skull, membranes, or brain, or where there is not mental imbecility, or completely idiocy, whether any given case of epilepsy is to be referred to the former or to the latter class; and, even where the mental powers are somewhat affected, some encouragement to the use of curative measures still remains. Under such circumstances, the treatment should be conducted on the following principles.

In most cases of epilepsy it will be expedient to begin with a full blood-letting from the arm; and the necessity of this measure will be so much the more urgent as the fits are either preceded or followed with headach; confusion of thought or recollection; ocular spectra, deranged hearing, or any degree of stupor; as the subject is young and plethoric; and as the evacuation seems to produce any impression on the symptoms.

In a very great majority of cases it will be expedient to draw blood from some part of the head, by means of leeches or the cupping-glass. It is of no great moment from what part of the head the blood is drawn. Leeches may be applied to the temples or behind the ears; but perhaps the most effectual method of local blood-letting for the removal of this malady, or preventing the recurrence of the fits, is by scarifying and cupping the hind-head, or the nape of the neck.

This evacuation should be repeated once a fortnight, once a month, four times or twice annually, according to the frequency and severity of the fits; and if any distinct order in their recurrence can be observed, the reason for its evacuation should be arranged as near as may be to those periods.

In all cases of epilepsy, without exception, it is indispensable to have the scalp shaved, and to wash the head daily with cold water.

In all cases of epilepsy, it is indispensable to regulate the functions of the stomach and bowels, to obviate indigestion and constipation, and to prevent excess in the use of food and drink. Purging is unnecessary; but the daily and regular eva-

cuation of the bowels is quite indispensable. The food should be light and digestible in quality; and abstemiousness rather than indulgence should be observed. Wine, malt liquors, and every form of spirituous drinks, must be utterly and completely abandoned.

To this mode of management firmly and assiduously observed, a large proportion of the curable cases of epilepsy will at length yield, without any aid from antispasmodic, narcotic, or tonic medicines. If, however, the fits still continue to return, after these methods have been for some time pursued, it will be requisite to insert a seton at the nape of the neck, or to destroy a portion of the integument at this place by the actual or the potential cautery. Of the former, the moxa is the best form. Of the latter, the caustic potass, either in substance, or made into a pommade by means of soap or lard, will be most convenient. When the surface is thus destroyed, it is allowed to suppurate; and the chronic inflammation thus resulting will be highly beneficial in removing the vascular distension of the brain or cerebellum. The time during which this process should be continued must be regulated by its effects. It is rarely beneficial sooner than five or six weeks; and it may be requisite to continue it in many instances, to double this time, or even to the extent of four months. When one cauterized surface has thrown off the dead slough, granulated, and shown a tendency to heal, it is better to make a fresh one in the neighbourhood, than to continue it open. A rule to be religiously observed, however, in all cases, is never to make it on parts so thin, or so near to the bone, that either the pericranium or the skull is liable to be affected. The inflammatory process outside is then attended with one within; and the measure, instead of proving remedial, becomes highly pernicious, and has more than once been attended with fatal effects.

Another method of effecting permanent and effectual revulsion is to make an incision through the scalp, along the course of the sagittal suture, and insert several peas, so as to maintain a considerable purulent discharge.

If this mode of proceeding fail to remove the fits permanently, there is little encouragement to trust either to antispasmodics, to narcotics, to tonics, or to stimulants, for more powerful influence, or more favourable effects. If, however, this is deemed advisable, the ammoniuret of copper, the nitrate of silver, the oxide or sulphate of zinc, or the arsenical solution

hold out the most probable means of affording relief, and they may be safely chosen to try the effects of tonics in general.

The first, though an active medicine, is generally given in too small doses to be of much use. Instead of the ordinary dose of one-quarter, one-half, or one grain, it should be given or, at least, carried to the amount of from two to five grains, twice, three, or four times daily. If in this amount it occasions vomiting, or severe pain of the stomach, the quantity may be diminished, till it is easily borne.

The nitrate of silver may be given in the ordinary dose of from half a grain or one to five or six grains, in the form of pill, twice or three times daily, or in solution, in the proportion of one to five grains in the ounce of distilled water, when the dose is from one to two drachms. Its effect in communicating a permanently black or bluish tint to the skin, and especially to the exposed parts of the mucous surfaces, depends on decomposition of the metallic salt by the agency of light, and the union of oxide of silver with the hydrochlorates in the blood forming the chloride of silver; and is by no means necessary to the removal of the fits, as was by some supposed. This unpleasant result is said to be obviated by the habitual use of cream of tartar.

The oxyde known by the name of *flowers* of zinc was useful in curing epilepsy, in the hands of Percival of Manchester, Haygarth of Chester, White of York, and Bell of Edinburgh. By Cullen and others, however, they were found to be uncertain or inefficient; and perhaps they possess no peculiar sanative powers to recommend them above the remedies already mentioned.

Of this mineral a more energetic preparation is found in white vitriol, the sulphate, which was given by Johnson, Lettson, Pearson, and Hufeland with good effect. Two or three grains in the form of pill may be given three or four times daily.

The arsenical solution may be given in doses of from seven to ten drops three times daily.

An agent which has acquired considerable reputation as an anti-epileptic remedy on the continent, especially in several of the German states, is indigo. This substance was first employed as a therapeutic agent in the treatment of epilepsy, by Lenhossek, and afterwards by Grossheim and others. Its efficacy was afterwards tried by Ideler, a Prussian physician; and among 26 patients, to whom indigo was experimentally administered, 6 individuals recovered completely; 3 were dismissed cured, and had, after intervals of from 8 to 12 months, a relapse, under

the operation of causes, which might have induced epilepsy; of 11 patients, the condition underwent an essential improvement; and in 6 individuals no change took place. At first, the patients were wont frequently, though without effort, to vomit; after some days this ceased, and in its place, there took place diarrhœa, which at first caused from 6 to 8 motions daily, and was occasionally accompanied with moderate colicky pain, but afterwards moved the bowels only two or three times daily, though with fluid motions, and continued so long as the indigo was used, yet without impairing the appetite or digestion. The curative reaction of the nervous system to the agent was principally indicated by this circumstance, that the epileptic symptoms in the first period returned more frequently, and attained a higher degree of intensity, but afterwards became less frequent, milder, and at length entirely disappeared.

Indigo has been tried pretty freely by Dr Strahl of Berlin, Dr Roth, and various other practitioners; and the general result is rather favourable. I have administered it in several cases of epilepsy, in all of which, except one, recoveries took place, but in all of which at the same time I found it requisite to have recourse to other therapeutic agents, chiefly depletion from the head, or from the system, revulsion by means of blisters, and the frequent use of laxatives.

The physiological effects of indigo are remarkable. In almost all patients its use is followed at first by squeamishness and vomiting; and the violence and frequency of the emetic efforts are in proportion to the individual irritability of the gastric nerves. Females vomit more readily than males. The vomiting is at first so violent, that it is often requisite to abandon the use of the remedy for several days.

After vomiting has continued for some time, a week or fourteen days, the stomach appears to endure the indigo, as sickness and vomiting gradually abate, and are followed by diarrhœa. This, however, is less constant than vomiting, and many patients do not present the symptom. When diarrhœa has once commenced, it usually continues some time. The motions are soft, semifluid, and of a dark blue black colour; and in some cases considerable tormina and other uneasy feelings, amounting to colicky pains, are complained of.

Patients who are exempt from vomiting, while taking indigo, appear to be attacked with more violent colicky symptoms. By the continued use of the medicine, there is induced a

species of gastro-enteric irritation with loss of appetite, head-ach, and giddiness, and sometimes the sense of dazzling lights in the eyes.

After indigo has been taken for some time, it is usually absorbed from the surface of the intestines, and carried into the circulation; and it communicates to the urine a dark-violet colour, deepest in the morning. On the amount of the secretion, it seems to exercise no influence.

In one case in which I continued its use for several weeks, the surface of the skin became blue and tinged the linen of the patient; blood drawn by cupping, and from the arm, showed a bluish tint, and the serum was distinctly blue-coloured; and a blue-coloured precipitate was observed at the bottom of the vessel containing the urine.

The dose of this agent varies from 8 or 10 grains, to one scruple, or one drachm three or four times daily. I have rarely been able to give the large doses administered in Germany, where, it is said, from half an ounce to one ounce daily has been used for months without inconvenience. The indigo obtained in England must be either purer, or a more powerful irritant of the stomach and bowels. In most instances, when it was carried to the extent of one scruple three or four times daily, the sickness and vomiting were so urgent and distressing, that it was requisite to abandon the use of the drug, and it was seldom possible to carry it beyond the amount of one scruple at a time. The best mode of exhibition is to combine it with aromatic powder, or to give it in the form of electuary with the aromatic electuary.

In conducting the treatment of epileptic patients, it is of the utmost importance to prevent or counteract the operation of all exciting causes. Those especially which operate either on the moral part of the constitution alone, or which operate at once on the material and moral feelings, demand the most sedulous and rigid attention. The epileptic must be taught to exercise a habitual control over all his appetites, feelings, desires, and passions; and if to this task he is himself incompetent, some means of restraint should be devised to do it, independent of his efforts. Where circumstances admit, he requires a guardian or custodier, as much as a person actually insane; and it is the duty of such an attendant to see, that while all necessary wants are supplied, and all reasonable wishes are gratified, no indulgence should be given to improper desires, violent appe-

tites, or capricious and inordinate feelings ; and all outrageous or impetuous passions should be checked and repressed. It is almost superfluous to say, that the indulgence of the sexual appetite, the immoderate gratification of which is too often a very powerful exciting cause, should be most cautiously and assiduously resisted by epileptic subjects.

§. V. Locked Jaw. *Tetanus*, *Tetanosis*. *Tetanus Idiopathicus* ; *Tetanus Traumaticus*. Starrkrampf. Wundstarrkrampf.

Of the Opisthotonos and Tetanus. By Lionel Chalmers, M. D. Med. Obs. Vol. i. London, 1770.—Account of the Diseases and Weather of South Carolina. By Lionel Chalmers, M. D. London, 1786. 8vo.—Essay on Hepatitis and the Spasmodic Affections of India. By T. Girdlestone, M. D. London, 1787.—Observations sur le Tetanos. Par M. Dazille. Paris, 1788. 8vo.—A Treatise on the Yellow Fever of Dominica, &c. By James Clark, M. D. &c. London, 1797. Chap. vii. of Tetanus or Locked Jaw.—Observations on the Diseases of Seamen. By Gilbert Blane, M. D. London, 1799. 3d edition, Chapter vi. p. 555.—Relation Historique et Chirurgicale de l'Expédition de l'Armée d'Orient, en Egypte et en Syrie. Par D. J. Larrey, Docteur, &c. Paris, 1804.—Dissertation sur le Tetanus en general, et particulièrement sur le Tetanus Traumatique. Par A. Pasquier. Paris, 1805.—An Account of the Diseases of India, as they appeared in the English Fleet and in the Naval Hospital at Madras in 1782 and 1783, &c. By Charles Curtis, formerly Surgeon to the Medea Frigate. Edinburgh, 1807. 8vo. P. 244.—Tetanus.—History of a Case of Tetanus cured by Purgatives. By H. Briggs, M. D. Liverpool. Ed. Med. and Surg. Journal, v. p. 149. Edin, 1809.—Coup d'œil sur les Differents Modes de Traiter le Tetanus en Amerique, &c. Par L. Valentin. Paris, 1811.—Memoires de Chirurgie Militaire et Campagne de D. J. Larrey. 3 Tomes, 8vo. Paris, 1812. Tome 3ieme.—A Case of Tetanus with Observations, &c. By W. C. Wells, M. D. Med. and Chirurg. Transactions of a Society, &c. Vol. iii. Art. 18. p. 241. London, 1812.—Cases of Tetanus and Rabies Contagiosa or Canine Hydrophobia, &c. By Caleb Hillier Parry, M. D. 1814.—Sketch of the Medical History, &c. By Sir J. Macgrigor. Med. Chir. Vol. vi. p. 381. 1815.—A Case of Tetanus. By Walter Vaughan, M. D. Med. Trans. v. p. 469. London, 1815.—A Treatise on Tetanus. By John Morison, M. D. Newry, 1816. 8vo. Pp. 122.—Observations on Tetanus. By Drs Dickson and M'Arthur. Ibid. Vol. vii. 448. 1816.—On the Nature and Treatment of Tetanus and Hydrophobia, &c. &c. By Robert Reid, M. D. Dublin, 1817.—Essai sur le Tetanus Traumatique. Par M. Murat. Paris, 1817.—De Medulla Spinali Nervisque ex ea prodeuntibus, Annotationes Anatomico-Physiologicæ auctore, C. F. Bellingeri. Augustæ Taurinorum, 1823. 4to. Pp. 133.—Case of Tetanus from Laceration of the Median Nerve. By R. Liston, Surgeon. Ed. Med. and Surg. Journal, xxi. p. 292. Edinburgh, 1824.—Anno Clinico Medico Compilato da Carlo Speranza, Già J. R. Medico Provinciale nel Regno Lombardo Veneto, ora Prof. di Terapia Speciale e di Clinica Medica nella Ducale Università di Parma, &c. Aggiunto un Commentario sul Tetanos, p. 229. (This is the most comprehensive and able Essay on Tetanus extant.) Parma, 1825, 8vo.—Case of Tetanus. By W. W. Manifold, Surgeon, Liverpool. Ed. Med. and Surg. Journal, xxiv. p. 277, 1825.—Case of Tetanus successfully treated. By George Alexander, M. D. Prince of Wales's Island. Ibid. p. 309.—Observations on Tetanus ; illustrated by Cases in which a New and Successful Mode of Treatment has been adopted. By

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THE spasmodic contraction of the muscles, known under the name of Tetanus, have been distinguished into *trismus* or locked jaw, *opisthotonos* or hind-cramp, *emprosthotonos* or fore-cramp, and *pleurosthotonos* or side-cramp, according to the muscles affected. The modifications supposed to be distinguished by these names are, however, different varieties only, or rather degrees of the same disease; and though the names may still be retained for the purpose of designating these varieties, all involuntary tonic spasms whatever may justly be comprehended under the general appellation of tetanus.

Tetanic spasms may occur in the course of several different diseases, as fever, ague, yellow fever, inflammation of the brain or spinal chord or their membranes, cholera, especially that of Asia, hysterics, the irritation of worms in the intestines; as a consequence of certain poisons, as opus, strychnine, oxalic acid, &c.; and after lacerated, contused, or punctured wounds; and in each of these cases the spasmodic contractions are conceived to be *symptomatic* of a primary morbid action. When, on the contrary, they take place without being manifestly preceded by any of the causes now enumerated, the spasmodic contractions are said to constitute *spontaneous* or *idiopathic* tetanus. Though it may be doubted whether any attack of tetanus is ever truly idiopathic in the sense here meant; though every instance of tetanic spasm, whether taking place in the course of fevers or other diseases, after wounds, or in consequence of the narcotico-acrid poisons, or appearing in what is termed a spontaneous manner, depends in all likelihood on the same pathological state of the nervous system, and though it is chiefly the imperfection or inaccuracy of our observation, that renders this distinction requisite; yet it is convenient in the present state of knowledge to keep it in view. With this admission, however,

it must be remarked that the tetanic symptoms which take place spontaneously are so similar to those resulting from other obvious causes, and especially to those which arise from punctured or contused wounds, and occur under circumstances so much alike, that the history and observations here to be delivered will, with few exceptions, apply to both. It may also be remarked, that for practical purposes it is unnecessary to notice more of the symptomatic species than that now mentioned as originating under certain circumstances from wounds. While the former is known under the name of spontaneous or idiopathic tetanus, it is convenient to distinguish the latter by the appellation of traumatic tetanus.

Tetanic spasms may occur in almost any climate and at any season; but they are most frequent in the warmest climates and during the warmest seasons, especially when the atmosphere is liable to be immoderately heated during the day, and much chilled with cold winds and heavy dews during the night. Thus tetanus used to be common in South Carolina, (Chalmers,) at all seasons, but principally in the summer, when the people after suffering intense heat during the day, were not unfrequently exposed to great cold in the night. For the same reason it has at all times been a disease of the West India Islands, (Hillary, Blane, Chisholm, James Clarke, Gillespie, Williamson); in Surinam and Demarara, (Morison); in various parts of Asia and the East Indies, (Bontius, Dr John Clark, Girdlestone, Curtis,) and Ceylon (Marshall,) and in the Mediterranean, as in Minorca. (Cleghorn.)

In such situations, as the influence of mere physical causes in the production of tetanus is considerable, the infliction of a wound is much more likely to be followed by tetanic symptoms than in milder climates, where the vicissitudes of temperature are less severe and less sudden. Thus though tetanic symptoms may and do occur after wounds in this and other countries placed within the temperate zones, yet they are greatly more common in tropical countries; and while it is chiefly after contused or lacerated wounds that they are seen in this country, they may often be observed after a slight cut, or an ordinary incision performed in the course of operation in the regions of the torrid zone. (Dickson.) In countries like our own the kind of wound most liable to be followed by tetanic symptoms is laceration, or puncture of tendinous, aponeurotic, fibro-cartilaginous, or other fibrous parts. Amputation, cas-

tration, and other incised wounds, however, have been followed by tetanus (Parry) even in this country. In hot climates, though wounds of this description are almost certainly followed by tetanus, yet the disease may arise from a much less severe agent, and is sometimes known to succeed an ordinary cut, or the incisions of amputation. Gunshot wounds, which are always attended with much contusion, are very often followed by tetanic symptoms; and in European countries, every great battle is succeeded by the more or less general prevalence of this disease among the wounded. The accessory influence of climate and physical agents is forcibly illustrated by observing the phenomena which take place under similar circumstances in warm or tropical countries. Thus tetanus was observed to affect many of the wounded seamen after the action of the 12th April 1782, under Lord Rodney in the Caribbean Sea. (Blane.) Many cases occurred after an action off Cuddalore in the East Indies, in July 1783. It was likewise common, both in the French and English armies in Egypt, during the campaigns of 1799 and 1800, (Larrey); it occurred also in the French army during the German campaigns, (Larrey, *Mem. de la Chirurgie Militaire*, Tome iii.); and in the Spanish peninsula it was very prevalent after all the great actions, especially after those of Vittoria and Pampeluna, (Macgrigor,) and after the battle of Thoulouse. (Hennen.) It was here observed to occur in every description and every stage of wounds, from the slightest to the most formidable, from the healthy and the sloughing, from the incised and lacerated, [from the most simple and the most complicated. In all these cases, however, it is not so much the wound as the inflammatory process which it causes, that induces the tetanic symptoms. There are several instances, for example, of the disease being brought on by the inflammation of frost-bite, of burn, and in some cases of common ulcers spreading and affecting the deeper textures.

The influence of vicissitudes of atmospheric temperature is demonstrated in the following fact. At the same time at which Baron Larrey met with many cases after the actions in the Egyptian campaign, (March 1801,) among upwards of 100 English and French wounded soldiers, many severely, in the battle of the 13th, kept on board ship under the care of Dr Dickson, not one case of tetanus appeared. The more steady and less changeable temperature at sea was likely the most powerful cause of this exemption.

Lastly, from some cases adduced by Dr Wells, it appears that the constitutional irritation, caused by mercury, may be followed by well-marked tetanic symptoms. (*Med. and Surg. Trans.* Vol. iii. 241.)

The disease comes on in various modes, according as it succeeds exposure to cold, or a lacerated wound, and sometimes also according to the habit or age of the individual, the climate, and other external circumstances. When it comes on after exposure to unusual cold, as in tropical countries during the night, it may appear in the course of a few hours after, or in the course of the subsequent day. When it succeeds a wound, it may appear at any time after its infliction between the 3d and 26th day. In the West Indies Sir Gilbert Blane found it take place in every period between the 2d or 3d day and the 4th week. In the peninsula, it was observed that, if it did not occur for 22 days after the date of the wound, the patient was safe. In one of the cases given by Baron Larrey, however, the symptoms appear to have taken place on the 26th day.

SEMIOGRAPHY.—These variations in the rapidity of its attack render it difficult to note any preliminary symptoms; and hence the disease is said in some instances to come on suddenly, with stiffness and spasms about the head and neck at once, and in other cases more slowly after uneasy sensations of weakness, fatigue, bruising or soreness of the limbs, want of sleep, fainting, and other marks of constitutional disorder. In the traumatic variety it is often preceded by increase of pain in the wound, nervous twitchings in the limb, more or less pain in swallowing, and uneasy constriction at the epigastrium, causing much irritation and restlessness. When the wound is examined, it is found to be dry, hot, and, instead of being covered with purulent matter, discharging a thin bloody serum, or a dark ichorous fluid. The first unequivocal symptoms of the disease are a sense of stiffness in the jaws and back of the neck, which gradually increasing renders the motion of the head and opening of the jaws difficult and painful, and a sense of uneasiness about the root of the tongue, which first impedes and at length entirely interrupts the power of swallowing. These symptoms are either accompanied or soon aggravated by the addition of a pain shooting at intervals from the lower end of the sternum through to the back, while the muscles of the neck and jaw becoming at the same time unusually stiff, the head is forcibly drawn back and the jaws more or less

firmly shut. This, which may be regarded as the incipient and the mildest form of the disease, is that termed locked jaw, (*trismus*.) It comes and goes in fits, lasting some minutes or even a quarter of an hour at a time, and with intervals of various length. The fits are in general easily excited by swallowing, or any attempt to throw the muscles into action, and in some instances by the mere imagination of the effort. During their continuance the extensor muscles of the head and neck, and the temporal and masseter muscles may be felt very firm and hard like a board; and there is reason to believe that the pain shooting from the end of the breast-bone to the back depends on spasmodic contraction of the diaphragm.

These, however, are seldom the only symptoms of the disease. As the sterno-dorsal pain occurs more frequently, continues longer, and is more severe, a greater number of muscles begin to be affected with spastic stiffness or cramp. Not only those of the neck, but the muscles of the back of the trunk in general become stiff and cramped, and the whole body is forcibly bent backwards, constituting the form of the disorder termed *opisthotonos*. At the same time the muscles of the extremities begin in general to be affected. By affection of the deltoid and pectoral muscles the shoulders are awkwardly raised forward, and the arms are stretched out or drawn across the body. In the lower extremities the flexor and extensor muscles becoming cramped, at the same time keep the limbs rigidly extended. The abdominal muscles are more or less affected from the beginning, and at this stage become so rigid as to retract the belly strongly, and render it as hard as a board.

Hitherto the extensor muscles chiefly are the seat of the spasmodic contractions. The flexors at length partaking in the disorder antagonize the extensors so completely, as to maintain the head, trunk, and lower extremities rigidly extended and incapable of being moved in any direction; while the arms, which had hitherto been little affected, are stretched out immovably. This form of the disease is that chiefly distinguished by the name of *Tetanus*, or universal stretching. The lateral cramp (*Pleurosthotonos*) occurs principally when the muscles of one side are paralytic; while the fore-cramp (*Emprosthotonos*) depends either on some peculiarity in the posterior muscles, by reason of which they are less affected than in ordinary cases, or on the flexors being more affected than the extensors. (Larrey.) Though not seen by Chalmers, and admitted by

Cullen to be rare, it is described by the ancients, and was the most frequent form observed by Larrey in Egypt.

When the disease is fully established, every voluntary muscle almost is affected with tetanic rigidity. Not only are the head, trunk, and extremities forcibly and painfully stretched as it were on a rack; but the forehead is drawn into wrinkles; the eyes, in some instances distorted, are fixed immovably in their sockets; the nostrils are drawn upwards, while the cheeks are stretched back towards the ears; and the whole countenance assumes the aspect of the most hideous grinning (*risus Sardonicus*.) The tongue, which had only been exempt from spasm, is at length forcibly thrust out between the teeth, adding at once to the deformity of the face, and to the sufferings of the patient by the laceration which it invariably suffers from the teeth firmly set against each other, by the locking of the jaws. Even the involuntary and semi-voluntary muscles are not exempt. While the abdominal muscles bind down the ribs forcibly, and prevent the expansion of the chest, the diaphragm does not rise and fall naturally, nor undergoes complete relaxation, and the heart itself is contracted by a sort of tetanic stiffness also preventing relaxation. In this state, violent spasm or convulsion attacking the heart or diaphragm, may suddenly extinguish life; or, when these organs are at length enfeebled by the repeated and violent action of the spasms, general relaxation may ensue, and terminate in the course of eight or ten hours in death. (Morison.)

Though these spasms are attended with a peculiar sense of painful squeezing, as if the parts were crushed between two boards, they are not constant; and when they subside, the pain goes off, or is succeeded by a sense of soreness and bruising. The intervals depend on the severity of the attack, or the stage of the disease, and its spontaneous or traumatic origin. In ordinary cases of spontaneous tetanus, the spasms, after continuing for some seconds, or a few minutes, are followed by an interval of relaxation, lasting about 10, 15, or 20 minutes, according to circumstances. In more severe cases, especially if originating from a wound, and when the disease has continued longer, with constant rigidity of some of the muscles, especially those about the neck and throat, and those of the belly, violent spasms come on every five or ten minutes, (Morison,) and last perhaps four or five minutes (Parry) at a time. They are readily induced by any effort, or even, as already stated, by

the imagination of effort; but the most ordinary causes are the attempt to swallow, or pressure on the belly.

The duration of the disease varies. Chalmers represents it to be rapid in proportion to the violence of the first attack; and he states it as a general fact, that cases of this description terminate fatally in 24, 36, or 48 hours, and rarely survive the third day. Morison, again, represents the duration to be in the inverse ratio of the suddenness of the attack after the supposed cause. He knew a case terminate fatally in 40 hours, and one prolonged for 20 days, and yet prove fatal. In ordinary instances, however, when the disease terminates in death, it does so between the third and fifth day, or at most before the tenth. When it is prolonged beyond this period, it is to be regarded as more chronic than acute, and, in general, as a milder and more manageable disease. Chalmers knew a case in which the spasms occurred daily for six weeks, after which recovery eventually took place.

Tetanus has been said to be seldom attended with fever. (Cullen.) On this point, however, the testimony of different observers is at some variance. In the commencement the pulse is in general natural both in strength and frequency; but as the disease advances it becomes, in general, quicker than natural, (Chalmers, Boyd, Morison,) somewhat fuller, in general hard, and almost always irregular. The quickness varies according to the presence or absence of the fits, being eight or ten beats more in the minute during the spasms than in the intervals. (Morison.) It may vary also according to the rapidity and severity of the disease, (Parry,)—a pulse above 100 early in the disease being in general a bad symptom. After the complaint has subsisted for three or four days it may not be above 80 or 90, but is almost always very quick, small, and irregular, and a strong fluttering of the heart may be perceived. (Chalmers.) It is probable that these variations in the state of the circulation depend partly on the heart partaking in the general spasms, partly on the constraint of the organs of respiration, and partly on the influence which the violent action of the muscles exercise on the arterial and venous tubes passing into their substance. The blood drawn may vary; but in the best authenticated cases it has presented a well-marked buffy coat. This appearance may depend in some cases on the state of the wound.

The heat, and dryness or moisture of the skin correspond

with the state of the pulse. In the beginning the skin is almost natural, or at most a little dry. As the disease advances it becomes warm, and is moistened with partial sweats. Towards the conclusion the surface is chilled; and cold clammy sweats almost invariably precede the fatal termination. The urine is suppressed, or is voided with pain and difficulty.

The bowels, which, previous to the appearance of spasms, are invariably costive, continue so during the whole course of the disease, and are always slowly and with great difficulty moved by medicine. Vomiting sometimes appears early, but does not continue. In all other respects the functions are natural. Apprehension is distinct and prompt; memory unimpaired; and judgment clear and correct to the last.

The danger and probable termination of tetanus may be estimated from the cause which produces it, the suddenness and severity of the attack, and the frequency with which the spasms recur. Idiopathic tetanus is doubtless a milder and more manageable disease than traumatic tetanus, which in a great proportion of cases terminates fatally, whatever be done. Idiopathic or spontaneous tetanus, there is reason to believe, may terminate favourably whatever curative means are employed; and this, Morison is inclined to think, actually takes place in the West Indies and in Africa. The traumatic form, again, is said to be milder in the West Indies than in Europe. The conclusion regarding the danger derived by Dr Parry from the state of the pulse requires further confirmation; and perhaps it is to be referred to the degree in which the heart and diaphragm are affected by the disorder. In future cases it must be desirable to ascertain the state of the organs of circulation and respiration by means of the stethoscope.

PATHOLOGY.—The pathology of this disease is very obscure, and presents difficulties which are almost insurmountable. It is known that the spasmodic actions affect the muscular system exclusively; but this is all that can be positively affirmed of the disease. Nothing is ascertained either concerning the influence which the state of the nervous system may exercise in producing the spasms, or concerning the connection which may subsist between the alleged remote causes and the deranged action of the muscles. It has been generally supposed that some morbid state of the nervous system is necessary to the formation of the disease; but almost all the views hitherto given on this subject are either vague, or high-

ly conjectural, or apply only in a partial and limited manner. An opinion originally proposed by Galen, and afterwards by Fernel, Willis, and Hoffmann, that tetanus depends on a morbid state of the spinal chord and its nervous branches, has been reproduced in modern times by Reid and others, who have laboured much to confirm it by appeals to morbid anatomy.

Speranza especially, who has composed a learned commentary on this disease, and has compared carefully the symptoms of many different cases, and the necroscopic appearances in the organs in as many cases as was practicable, and especially those in the cases recorded by Tommasini, Brera, Borda, Bergamaschi, and himself, arrives at the conclusion, that the pathological condition of tetanus consists in an inflammatory process, which attacks generally or partially the spinal marrow, with affection of the nervo-muscular system. This inference he thinks is justified by the unwonted disturbed motions excited in the spine, the great congestion of its vessels, the turgescence of these vessels, and the morbid effusions found after death.

But though in a few cases some part of the spinal chord has presented unusual vascularity, bloody or serous effusion, or other traces of morbid action, and though injury of the spinal chord is known occasionally to be succeeded by tetanic symptoms, (*Ann. Univ. di Med. Feb. e Marzo 1828*;) (*Combette, Arch. Gen. Juin 1831*); in a much greater proportion of cases (*Parry, Morison, Dr J. Thomson*), no morbid change can be recognized; and very considerable disease of the spinal chord is often observed to take place without the production of a single tetanic spasm. The opinion of Hamilton and Abernethy, who think that the main seat of the disorder is to be sought in the stomach or some part of the alimentary canal, is not much more capable of positive demonstration. Larrey, indeed, found the pharynx and œsophagus contracted, and their mucous membrane red, and covered with a reddish viscid fluid. The dissections of Dr Macarthur show that the intestinal tube may be inflamed, and its mucous surface lined with a yellow, waxy, offensive-smelling fluid. But, in the first case, the red appearance may have been the effect of the violent spasmodic contraction about the throat; and the inflammation of the intestines in the second may have been the result of the muscular constriction; while the waxy fluid was perhaps a mere morbid secretion. In every view of the subject the unusual appearance of the intestinal ca-

nal may be admitted to be a simultaneous state, but not an efficient cause, of the tetanic symptoms.

In short, in applying the results of dissection to elucidate the pathology of tetanus, a great objection everywhere is presented in the difficulty of drawing a correct distinction between the appearances which are caused by the violent and irregular muscular action, and those which may be supposed to be marks of primary and independent morbid action. It is only after due allowance has been made for the correction of this source of fallacy, and after the appearances in many instances have been carefully compared, that satisfactory conclusions on this head can be formed.

DIAGNOSIS.—Tetanus must be distinguished from hydrophobia, which will be easily done by comparing the symptoms of both; from hysteria, with which it has been confounded and perhaps may be complicated; from ordinary convulsions; and from Asiatic cholera, to which the spasms give it some resemblance.

THERAPEUTICS.—The treatment has been as unsettled and irregular as the pathology is obscure and uncertain. According to the notions entertained of the pathological nature of the disease and the proximate cause of the spasms, different remedies have at different periods been employed; and all with the same variety of result. With the view of controlling the spasmodic actions, the narcotic influence of opium, wine, or pure spirits, separately and conjointly, and the antispasmodic powers of musk, castor, camphor, assafoetida, oil of amber, and Barbadoes tar have undergone repeated trials. Upon the principle of inducing relaxation, profuse blood-letting has been practised; the warm-bath has been ordered; and the sedative effects of large doses of foxglove, tobacco, or hydrocyanic acid have been tried. By the opposite hypothesis, which ascribed the spasms to loss of time, liberal doses of bark and port wine, the cold bath, and the cold effusion have been administered. Upon the principle of effecting a sudden, considerable, and violent change of action in the system, mercury to profuse ptyalism has been given. Another theory, which, if not directly curative, is at least free from danger, is that which, ascribing the disease to irritation of the alimentary canal, proposes to cure it chiefly by purgatives. The hypothesis which traces it to irritation of the spinal chord proposes to counteract this by blisters over the spine, or stimulating and mercurial frictions in

its neighbourhood. Lastly, by those who regard the wound and its condition as the main cause of the disorder, particular attention is directed to be given to its appearance and its discharge; and stimulating applications, deep and extensive incisions, or entire removal of the source of irritation by amputation, when practicable, have been recommended with more or less confidence, according to the views and experience of individual practitioners.

It is unnecessary to attempt to estimate the merits of these several means of cure; nor would it be of any avail to attempt to ascertain the circumstances which indicate their respective employment, or their probable success; since none has been invariably useful, and the greater part have been found miserably to disappoint the expectations entertained of them. A more profitable duty will be to specify the mode of treatment, which attentive consideration of the nature of the disease, and of the influence and operation of remedies, suggests as the most likely to be advantageous.

In all cases of tetanus, it is indispensably necessary to open the bowels freely and effectually; and it is the first step that should be taken towards the removal of the disease. The most convenient medicine for this purpose is calomel, which may be given to the extent of five grains, with two or three grains of aloes every hour, until the bowels are freely opened. The insensibility of the bowels, and the constricting effect of the spasms is so great, that twenty or even thirty grains of calomel may be taken before this result takes place. If the intervals are considerable, and the effort of swallowing does not readily induce the spasms, the same object may be attempted by the aloetic or compound colocynth pill, by infusion of senna in proper doses, with or without Epsom salts, or by castor oil. When the act of deglutition is difficult and painful, or when it induces the spasmodic contractions, the most convenient medicine for exhibition by the mouth is croton oil, a drop of which may be poured on the tongue at intervals of an hour until the bowels begin to be affected. In circumstances where the act of deglutition is not followed by such inconvenience, a single drop of croton oil, with half an ounce or an ounce of castor, may be given with the best effects. In all cases it is requisite to employ injections;—to aid the operation of purgatives when they can be given, and to supply their place when they cannot. One of the best is infusion of senna, with two ounces of oil of

turpentine, which, if injected into the colon, has in general the effect of rousing its action, and if not, it should be repeated till it does. Infusion, or rather extract, of tobacco is much commended by Earle; but it cannot always be depended on, (Macgrigor). It is thought to be more useful in the form of smoke impelled into the intestines; but this requires trial. When the bowels are once opened, their action should be maintained steadily and regularly as long as the symptoms continue.

In a large proportion of cases of tetanus, venesection to a considerable amount is requisite. The circumstances which indicate its necessity are, in spontaneous tetanus, the length of the fits, the severity of the spasms, and the quickness, fulness, or hardness of the pulse; in the traumatic form the pain, tension, or swelling of the wound, a bad or imperfect suppuration, and any tendency to gangrenous inflammation;—in both kinds the youth, robust or plethoric habit of the patient.

The extent to which it is to be carried must be regulated by its effects in the spasms, by the strength and vigour of the patient, and the state of the blood drawn. It will seldom be requisite to take less than twenty ounces; and in most cases it will be proper to take thirty or thirty-five or even forty ounces at a first blood-letting; and if this quantity is succeeded by fainting and other symptoms of relaxation, good effects may be anticipated. If it seem inconvenient to draw so much at once, twenty-five ounces may be taken at first, and as much in the course of a few hours, unless the spasms are decidedly relieved. In some instances, it may be requisite to bleed to the extent of seventy or eighty ounces, before the spasmodic actions show any tendency to abate.

In all cases of tetanus, the exhibition of opium will be more or less requisite; but its efficacy will depend very much on the manner and time at which it is given. It should not be given before the bowels have been well-opened; nor if it has been given, should it be continued, if they are still constipated. The most convenient season for its administration is after the efficient use of purgatives, and after blood-letting. The dose must be regulated by its effects on the spasms, which almost always require pretty large doses. But exhibited in the manner now recommended, these doses may be considerably smaller, than when it is given at first, and trusted to alone. In ordinary circumstances, a drachm of the spirituous tincture, or

of the sedative liquor, half that quantity of the black-drop, or two grains of opium in powder, with aromatic confection, will be sufficient to produce all the benefit which the drug is likely to accomplish, after effectual purging and copious blood-letting. These doses may be repeated at intervals of one hour, one hour and a-half, or two hours, according to circumstances and the effects produced.

When the symptoms and urgency of the disorder seem to require larger doses, the opium should be given in union with ipecacuan, or tartar-emetic; and this combination is so much more rational than opium alone, as when the drug operates beneficially, or when the disease subsides under its use, it is always accompanied with copious general perspiration. With this view, a scruple and a-half, or two scruples of Dover's powder, (*Pulvis ipecacuanhae et opii*,) or two grains to four grains of opium, either alone, or aided by, from five to ten grains of James's powder, may be given every hour, till the spasms are alleviated, or the skin becomes uniformly moist. Another mode of producing the same effect, is to give a pill consisting of three grains of opium, two grains of tartar-emetic, and two grains of calomel every hour, until the bowels are opened, or sweating takes place. When the state of the muscles of deglutition prevents these medicines from being swallowed, they should be injected into the bowels.

To the measures now mentioned, most cases of tetanus that are manageable by medical treatment will be found to yield. If, however, after efficient purging, adequate blood-letting, and the full trial of the powers of opium, both alone and with ipecacuan or antimony, the spasmodic actions still recur or are not sensibly controlled, it may then be expedient to put the system rapidly under mercurial influence, and to have recourse to the use of the hot-bath twice daily at least. The ordinary blue ointment should be rubbed in, and the blue pill may be given until the gums begin to be tender; but profuse salivation is quite unnecessary, and can only aggravate the sufferings of the patient. The feelings will be rendered more comfortable by immersion in a bath at from 97° to 100° Fahr. in which he should continue for twenty or twenty-five minutes if possible, when energetic friction with dry cloths, and diligent massing or champooing will tend, if not to remove the spasmodic contractions, at least to diminish the painful hardness of the muscles.

Acupuncture has been used apparently with benefit; but it is a remedy still under probation, and where the above-mentioned means fail, it is not likely to succeed.

The treatment of the wound belongs more to the surgical than the medical management of the disease. It is sufficient to say that if hot, painful, and tense or swelled, incisions will be beneficial; or if this is thought inexpedient, leeches should be applied, and followed by a warm emollient poultice. Bony spiculæ, foreign bodies, or other mechanical irritants ought to be removed. The effect of stimulating applications is ambiguous. Experience has shown that amputation, though once recommended by Larrey, is of no avail in curing or even alleviating the established disease. (Guthrie, Macgrigor, and Hennen.)

§. VI. Canine Madness. *Rabies Hydrophobia. Rabies Canina. Rabies Contagiosa*, (Parry.) La Rage. La Rabbia. Die Hundswuth; Die Wasserscheu.

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xlili. p. 69. 1835. (Two cases, one from the bite of a Cat; doubtful; the other from the bite of a Wolf; with dissection.)—Contributions to Pathology. Hydrophobia, or Rabies, &c. By Alexander Kilgour, M. D. Aberdeen. Edin. Med. and Surg. Journal, liii. p. 340. Edin. 1840.

THOUGH Sauvages, Cullen, and others, have admitted the existence of hydrophobia occurring spontaneously, it may be justly questioned whether this has been done on just grounds. Authors, indeed, have related many cases in which hydrophobic symptoms are said to have appeared without being preceded by the bite of a diseased animal. In the greater part, however, these symptoms manifestly depended on inflammation of the throat, pharynx, œsophagus, or stomach, (Parry,) or on phrenitis, or hysteria, tetanus, or some similar nervous disorder. Of the few in which the hydrophobic symptoms actually belonged to genuine canine madness, little doubt can be entertained that though no bite was known to be received, yet the poison must have been previously applied in some form or other, however obscure. All the best authorities, as Mease, Hamilton, Hunter, Ferriar, Parry, and Trollet, agree in denying the spontaneous occurrence of hydrophobia. But, independent of the weight of authority, it is sufficient to say that unless the definition be restricted to that train of symptoms which results from the bite of a rabid animal, it is impossible to speak or reason on the subject with any precision.

It is also necessary in the present state of knowledge to restrict the origin of the disease to the bite of the dog, or animals of that family, as the wolf, the fox, the jackal, and perhaps the hyena. Instances of hydrophobia succeeding the bite of a cat have been adduced by Morgagni, by Fothergill, by Vaughan, by Rossi, Mayer, Bonnet, Dr A. T. Thomson, and Dr Keir; and this opinion is also entertained by Dr Robert Hamilton, and Dr John Hunter, and even by Parry; but though it may be admitted that the cat is, like other animals, capable of receiving the rabid virus, and of undergoing the consequent disease, it does not follow that it is capable of communicating the disease. The same may be said of the instances of reported hydrophobia, alleged to succeed the bites of badgers, weasels, polecats, and even cocks and other fowls;—which, though capable of receiving the disease from the dog, are certainly incapable of communicating it. The symptoms supposed in such circumstances to indicate ca-

nine madness are doubtless to be regarded as belonging to tetanus, or some other nervous affection, and in some instances are the mere effects of apprehension. In short, as the rabid poison seems not to be generated in any family of animals except that of the dog, so none save the individuals of this genus seem to be capable of communicating the disease. It is further obvious that none but a rabid animal can communicate it.

In this country, canine madness is communicated to the human species generally by the bite of the dog, and in some rare occasions by that of the fox; (James.) In France, Germany, Italy, Russia, and other continental countries, not only the dog but the wolf, which frequently becomes rabid, is the cause of its propagation. The frequency of the canine breed in all situations both in town and country has at once afforded greater facilities in studying the disease, and rendered the knowledge of its phenomena more important. Yet it is to be regretted that our information on this head is neither complete nor accurate.

It appears that dogs are liable to two diseases so similar to each other, that they have been often mistaken, and perhaps still continue to be confounded. The first of these, which has been well described by Dr Jenner under the name of the *Distemper*, (Med. Chir. Trans. Vol. i. p. 263), consists in spreading inflammation of the nasal, guttural, and bronchial mucous membrane, and of the substance of the lungs proceeding to hepatization. This disorder, which is contagious, is accompanied with very difficult breathing, and all the symptoms of severe catarrh, aggravated by the addition of convulsive motions of the voluntary muscles, similar to those of epilepsy. Its duration is from three to four weeks, when it either proves fatal or gradually leaves the animal, burdened, however, with the inheritance of the convulsive motions through life.

According to the testimony of the best authorities, canine madness is stated to denote its presence by the following symptoms.

The animal becomes dull, spiritless, and snappish; is easily offended at objects coming in his way; and is apt to quarrel with strange dogs, and to bite or worry fowls and other domestic animals. Losing at first his relish for food, he afterwards becomes indifferent to it; but he refuses drink at no period of the disorder. His natural bark is much altered, and

he is observed occasionally to howl in a peculiar tone. Though his recollection is somewhat impaired, he still recognizes his master and those with whom he had been familiar. The eye is prominent, wild, and glaring; the nose is dry and not so cold as usual; and the tail begins to droop.

In the course of a day (from twenty to thirty hours), these symptoms of disorder become more manifest. Quite indifferent to food, though he bites and gnaws, he rarely swallows. His memory becomes worse, and he first forgets the individuals of the family, then occasionally his master, and runs indiscriminately at persons known and strangers. Hertwig, on the contrary, states that the mad dog takes pleasure in recognizing acquaintances. If at liberty, he may stray from home, and wander about without design or object, biting and rending all objects in motion, whether living or inanimate. If tied up, he bites and gnaws everything within reach, is furious when approached, and is either not easily or not at all aired. At the same time, the eye is dully and muddy; the nose is very dry and hot; the chops are covered with tough frothy saliva; and, the hair being wet with clammy moisture, the hanging head, the hind and fore-legs drawn together so as to arch the back, and the drooping tail, combine to give the animal a look of extreme misery and weakness. This condition seldom continues above twenty or twenty-four hours, when the breathing, which from the first is attended with a peculiar convulsive tucking of the flanks during expiration, is observed to be short, quick, and panting; the surface is bathed in cold sweat; and the animal either expires in convulsions, or gradually gasps away.

It is remarked that healthy dogs instinctively recognize the first symptoms of disease in a mad dog, and shun him with such marks of consternation, that a courageous mastiff or bulldog has been known to fly in terror from a miserable cur or turnspit. (James, Roux.) According to Hertwig, however, this is a mistake, as healthy dogs allow rabid dogs to approach them without giving any proof of apprehension.

It has been long remarked that the rabid dog does not dread water, as is vulgarly believed.

The principal points by which the disease is to be distinguished from the distemper are, its much shorter duration, the absence of catarrhal symptoms, the absence of the convulsions

of the voluntary muscles, and by the tucking in of the flanks during expiration.

Hydrophobia, as now described, may arise spontaneously in the dog and in animals of that family; or it may be communicated by bite. In the latter case its symptoms appear within fifty days after inoculation. It appears that not all dogs bitten by rabid dogs, or otherwise inoculated with rabid virus, take the disease. Dr Hertwig found that, among 59 cases of inoculation by bite or otherwise, in 14 only, or about 24 per cent. did the symptoms ensue.

In the human subject, rabies is invariably the consequence of the application of saliva or mucus containing the rabid virus either to a wound already existing, or to one inflicted by the teeth of an infected animal. The wound is said to differ in no respect from the bite of a dog which is not rabid; and occasionally it is found to heal as soon and as readily. In general, however, a short time before the appearance of the hydrophobic symptoms, it becomes more or less painful; the cicatrix becomes hard and elevated; and a fresh discharge from it may take place.

The interval between infection and the appearance of the disease varies. In some cases it has been said to commence so early as 7 or 8 days after the accident, and in others so late as several years, (Morgagni, Tilton, Bardsley). But both these assertions are founded on erroneous facts and inaccurate observation. The shortest interval, according to Mead, is 15 or 16 days. Hamilton justly doubts whether any authentic instance could be produced so soon as the 10th day after the infliction of the wound; and from an extensive survey of cases, he rejects the idea of rabid hydrophobia taking place sooner than the 19th day, or later than the 18th month after the bite. In the cases from which Dr John Hunter drew up his account for the Medical and Chirurgical Society, the interval between the infliction of the bite and the appearance of the disease varied from 31 days to 17 months. The most common period was about 40 days, which well corresponds with the result of Dr Hamilton's inquiries, which gives the majority of cases between the 30th and 59th days inclusive. Parry makes the shortest interval, in a well-marked case, to be 23 days. Cases occurring earlier than this are in general to be referred to tetanus or some other convulsive malady. Those appearing at after pe-

riods are instances either of laryngeal, pharyngeal, or œsophageal inflammation, or of frenzy, brain-fever, hysteria, or the effects of some imaginary evil; and are quite unconnected with the operation of the rabid poison.

When the disease begins, the symptoms generally take place in the following order.

The pains in the wound, which are said to shoot, as it were, to the heart or epigastric region, are soon followed by great restlessness, anxiety, extreme sensibility to external impressions, and lowness of spirits and peevishness, for which the patient can see no cause, and which he strives in vain to resist. The skin is generally dry and the pulse quicker than natural, (Parry.) At the same time, on attempting to drink, he discovers that this is impossible, and that the effort is attended with such agonizing feelings, that the mere recollection is followed by violent agitation and insurmountable aversion. The reason of this is imperfectly known. Of those who are able to describe their sensations, some say that, on attempting to swallow a mouthful of liquid, they feel something, as it were, rising from the stomach, which obstructs the passage; while others complain of a sense of suffocation. During the attempt to pass liquids over the base of the tongue, convulsive motions may be observed in the larynx and pharynx, and even in the muscles of the chest and belly. (Hunter.)

It appears, however, that this *dysphagia* is not constant throughout the whole disease; and perhaps this is the only mode of accounting for the fact insisted on by Mead, Sauvages, Sagar, Houlston, Mease, Ferriar, and other authors, that the dread of water (*hydrophobia*), though frequent, is not an invariable symptom in canine madness. According to Trollet, this symptom, which he terms the *hydrophobic shivering* or paroxysm, assumes the form of a convulsive fit, preceded by peculiar marks, observing a definite course, and terminating in a certain manner. After feeling heaviness and pain of the head and general weakness for a night, a morning, or a few hours, the individual is suddenly thrown, at the sight of fluids, into a state of agitation similar to that which takes place in one who, in actual dread of cold water, is forcibly and reluctantly plunged into it. The chest is thrown into convulsive motions, during which short panting inspirations are succeeded by forcible rapid expirations; the arms are convulsively shaken; the head elevated and a little

reflected ; the person and limbs become rigid ; and the patient complains of suffocating tightness, referred to the neck and chest, and inability to swallow.

With the hydrophobic fit is conjoined a sense of internal burning, compared to the feeling of a hot suffocating vapour, referred to the neck and chest, spreading to the belly, or traversing the whole person, accompanied with a sense of oppressive anguish at the breast, and giving rise to frequent sighs and deep irregular inspirations. This convulsive breathing expels a mucous fluid, which is beat into foam by admixture with air. The skin is hot and dry ; and the pulse, which at first is little quickened, becomes rapid and somewhat sharp, (Parry, 88,) or hard, (45.) At the same time the patient becomes angry or frightened at the motion of a door, a stream of cool air, the sight of a glass or other brilliant object, and at slight causes is startled with alarm, or thrown into fits of uncontrollable fury.

The duration of the hydrophobic accession varies ; but, in general, it undergoes an abatement or cessation about the close of the first day, or in the course of the second, of evident rabies. (Trollet.) The pains and the inward burning abate ; the patient drinks, quenches thirst, and eats with facility ; and may even be led to entertain hopes of recovery. In a few hours, however, he is fatally undeceived. The hydrophobic accessions return with their invariable accompaniment, the hydrophobic vapour (Trollet;) they become so frequent with such indistinct remissions as to seem almost incessant ; while the general strength, already much impaired, prevents them from appearing so distinctly as at the commencement.

In the course of the second day, *i. e.* after the first twenty-four or thirty hours, all the symptoms become worse. The breathing is particularly short and rapid, (36 to 40), and convulsive. The mucous fluid becoming thick, ropy, and abundant, cannot be easily expelled ; and gives rise to violent efforts of excretion, and occasionally to retching or vomiting. The internal anguish appears also to be keen and agonizing. The mind, without being actually insane, hallucinates and is still more apprehensive ; and the misery and horror of the countenance are extreme. The pulse, becomes rapid, small, irregular, and tremulous, (130 to 140 or 160) ; and the surface is wet with partial sweats. In this state, the dis-

ease may terminate fatally, in one of three modes. It either causes instantaneous suffocation, by convulsion of the larynx, (Hunter) ; or the violent motions are followed by a season of calm, during which the patient, quite collected, expires without a groan ; or, the breathing becoming stertorous, a semi-comatose state soon terminates in complete death.

The duration of the disease from the first symptoms varies from thirty-six hours to four or five days. The most common period is from two to three days ; and death may take place on the second day, ordinarily happens on the third, and more rarely in the commencement of the fourth day. In the majority of cases, according to Parry, death takes place within the fourth day from the first affection of the organs of respiration.

This disease is liable to be confounded with inflammation of the larynx, (*laryngitis* and *trachea*) ; of the pharynx, (*pharyngitis*) ; of the gullet, (*œsophagus*) ; of the stomach, (*gastritis*) ; with frenzy, (*phrenitis*) ; with brain-fever, (*delirium tremens*) ; and with tetanus, (Mease, Parry). It must also be distinguished from some forms of hysteric disease, from certain varieties of mania, (Parry), from convulsions resulting from mere apprehension, and from the effects of imagination producing a sort of spurious hydrophobia. Genuine canine madness in the human subject is not common ; for notwithstanding the great number of alleged cases reported in the writings of physicians, and in periodical works, a very small proportion only can be admitted to be unequivocal examples of the disease. After a careful examination of all the cases recorded by English authors, Dr Parry was unable in 1814 to admit more than thirty-eight to be true cases of canine madness in the human subject ; and only seventeen of these to be so clearly marked as to afford satisfactory proofs of being genuine. All the others are to be considered as examples of one or other of the disorders enumerated above. From all these genuine hydrophobia is to be distinguished by the characteristic symptom of a local spasm of the respiratory organs only, very short in duration, and having long and perfect intervals ; but while present threatening suffocation ; occurring sometimes spontaneously, whether during sleep or watching, and always from the contact of liquids with the inside of the fauces. (Parry, 100).

It is above stated, that to the production of canine madness,

the bite of a rabid animal of the dog tribe, or some equally effectual application of the poison, is essential. The converse of this, that every bite of a rabid dog gives rise to rabies, does not, however, hold good. It appears in the first place, that not every animal bitten by a rabid dog is equally and indiscriminately affected with the consequent disease. Thus, dogs are most readily and certainly affected by the disease communicated in this manner; and sheep much less so. (Parry, 82.) The lower animals, in general, seem to be affected in a larger proportion than man; and among these, horses and pigs seem to be more frequently the victims of rabies than others. It further appears that dogs are more susceptible of infection than the human species. Thus, of four men and twelve dogs bitten by the same mad dog, every one of the dogs died rabid, while the four men escaped. (Hunter). Lastly, of such persons as are bitten by dogs undoubtedly rabid, a small proportion only are infected with the poison. Thus, though between twenty and thirty persons were bitten by the same animal from which the first patient of Dr Vaughan contracted the disease, yet none else showed any of its symptoms. Thus, Dr James mentions the case of a young man who was bitten three times by dogs, which were certainly mad, at the distance of some years between each bite; and though he never could be persuaded to take any precautions, he never took the disease. Dr Houlston also mentions that of nine persons bitten by the same dog, only one was taken ill. (Lond. Med. Journal, Vol. v.)

Of twenty persons bitten by a mad wolf in December 1774, in the neighbourhood of Troyes, nine only died rabid. (Thiesset). Of seventeen persons bitten by a mad wolf in 1784, near Brive, ten perished by hydrophobia, (Robiere). Of eleven persons bitten in like manner by a mad wolf in the neighbourhood of Dijon, four died rabid. (Roux.) Of twenty-four persons bitten by a wolf near Rochelle, eighteen perished. (Andry). Of twenty-one persons bitten by a raging wolf, sixteen became rabid, and were victims to the disease. In October 1812, nineteen persons were bitten at Bar-sur-Ornain; twelve died with the usual symptoms two months after the accident. (Gazette de Santé, September 1813). Mr John Hunter also mentions that he knew an instance of twenty-one persons being bitten by the same dog, in which one only took the disease. (Hamilton, 351). These variations may proba-

bly depend on the stage of the disease in the communicating animal, and on the circumstances under which the wound is made; the poison being most readily conveyed into the wound of a part uncovered with hair, or clothing, and where it has not been already detached from the teeth by previous bites.

It is uncertain whether other quadrupeds can communicate the disease. Mr Edwards of Long Melford inoculated a dog from the saliva of a rabid cow, without producing the disease. A different result was obtained from similar experiments by Dr Zinke of Jena, who found that sheep and swine might be inoculated with rabid virus, and afterwards communicate the disorder.

The possibility of the disease being communicated by the saliva of the human subject is doubtful. Dr Vaughan inoculated a dog with saliva taken from a child dying of hydrophobia, yet without producing the disease. The experiments of MM. Magendie and Breschet lead to an opposite conclusion. In the Hotel Dieu, on the 19th June 1813, they took the saliva of a rabid patient named Sarlu, immediately before death, conveyed it on a bit of lint to the distance of twenty paces from his bed, and inoculated by simple incisions two healthy dogs. One became mad on the 27th July, and bit other two, which then propagated the disease the whole summer.

The idea that the disease is capable of being communicated by the breath, though supported by Hamilton, is rejected by Vaughan, Mease, and Hunter.

MORBID ANATOMY AND PATHOLOGY.—The rabid virus has been generally supposed to reside in the saliva of the animal, which is understood to undergo some morbid change; and in proof of this, the salivary glands are stated to be invariably swelled in the mad dog. M. Trollet, however, has from various facts been led to the conclusion, that the poison resides in the bronchial mucus, which becomes thick, ropy, and abundant, and forms the viscid frothy slaver which is expelled with such difficulty, and covers the lips and chops. This opinion derives probability from some facts relating to the state of the tracheo-bronchial membrane in rabid animals and persons. But it is still in the situation of a mere supposition, to be established or overturned by future research.

The pathology of *rabies* is very obscure. Though many

dissections have been made, both of dogs and human beings cut off by this disease, yet no satisfactory results can yet be said to be given. The appearance most generally remarked is that of a number of red vessels, with small streaks of red blood on the inner coats of the stomach near the cardia, and occasionally a blush of redness spreading into the œsophagus. (Hunter, Baillie.) From this, it might be inferred that canine madness either consists in, or gives rise to, spreading inflammation of the mucous membrane of the gullet and stomach. These appearances, however, are not found in all cases: and in those in which they are observed, they seem to be the result of the violent compression exercised by the diaphragm during the convulsive breathing of the hydrophobic accession. They are also insufficient to explain the disturbance of respiration, the disorder of the functions of the brain, and the early and rapid approach of the fatal event.

Notwithstanding the force of these objections, however, the hypothesis of inflammation of the œsophagus and stomach, modified by the addition of inflammation of the pericardium, heart, liver, and even of the lungs, was afterwards reproduced by Ferriar, to explain the pathology of canine madness. To this, however, it may be replied, that the casual concurrence of inflammation in cases of rabies, however distinctly marked, is not sufficient to prove that inflammation, or even a variety of it, is the effect of the rabid poison. M. Trollet, indeed, who has been already mentioned, has, without being aware of the hypothesis of Ferriar, laboured hard to establish that part of it which relates to inflammation of the pulmonary mucous membrane. From the emphysematous appearance of the lungs often found in the persons of the rabid, from the deep-red colour of the organ, from the appearance of the tracheo-bronchial membrane, the viscid mucus covering it, and the peculiar sense of inward burning, this author thinks himself justified in inferring, that the rabid virus operates chiefly in producing a peculiar inflammation of the tracheal and bronchial mucous membrane, spreading continuously, accompanied with cerebral inflammation, and invariably proceeding rapidly to the fatal event.

This opinion of the presence of a morbid state of the tracheo-bronchial pulmonary membrane is plausible, and is supported on the whole by the evidence of a considerable number of dissections. From those made recently by British authors,

and which may therefore be supposed to be the most accurate, the following results may be given in confirmation. In two of 15 cases carefully examined, the lungs were found hardened and hepatized; in 8 of 15 cases, the mucous membrane of the windpipe is said to have presented marks of inflammation, and to have contained more or less frothy mucus. In 4 of 15 cases, the brain or its membranes presented effused fluid, but was otherwise healthy; in two no marks whatever; in one marks of cerebral congestion; in one a dark spotted patch like ecchymosis; in one nothing of consequence; in one appearances ascribed to injury of the head; in two doubtful appearances; and in four the head was not examined.

Another opinion, different from either of these, has been advanced by M. Salin of Paris, according to whom the spinal chord is the chief seat of disease in rabies. Independent, however, of the error by which this theory is vitiated, viz. that in the only case which furnishes any support to this opinion, the patient evidently laboured under symptoms of previous disease of the spine, the theory is entirely contradicted by the dissections of hydrophobic cases, and more especially by those of Lalouette and Dupuytren. The former states that in several persons cut off by rabies, dissection revealed no morbid change peculiar to this disease; and in ten cases examined personally by the latter, no change whatever could be detected. (*Dissertation sur la Rage*, par Ch. Busnout, Paris, 1814.)

From these results, which are certainly rather discordant, it is not easy to draw any general conclusion. They are here stated rather with the view of showing the present state of knowledge, and which is still deficient, than because they afford any satisfactory information. In the meantime it may not be improper to remark, that all the appearances said to be found in the lungs, heart, &c. might arise from the constrained and convulsive action of the diaphragm and the other muscles subservient to respiration, and that the appearances found in the brain and its membranes are again to be ascribed to the impeded and deranged state of the pulmonary circulation thus induced. If this view be correct, and it derives considerable support from the accurate observations of Dr C. H. Parry, (74, 77,) it must be inferred that the chief operation of the rabid poison is to cause a peculiar convulsive action of the diaphragm, perhaps of the intercostal and other muscles subservient to respiration,

especially of those of the larynx, both external and internal, and occasionally of the heart itself; coming on in fits, and tending, by its influence on the diaphragm and heart, invariably to a fatal termination. Regarding the mode of operation, however, whether by absorption or by the nervous system, nothing is ascertained.

Upon this part of the subject an hypothesis was, in 1822, imported from Muscovy by M. Marochetti, who was taught by the inhabitants of the Ukraine that the rabid poison, when applied and absorbed, gave rise, within the space of six weeks after the accident, to the formation of little hard vesicles, pustules, or knots beneath the tongue; that if these pustular vesicles were not seen within this time, it was a proof that the poison had not been absorbed, or at least was not producing specific effects, and the patient might be considered safe; and if they did appear they were to be opened by the lancet, and the matter which contained the poison carefully removed, and each pustule accurately cauterized. These views have not been confirmed by subsequent observation. The rabiferous sublingual pustules have not been observed in subsequent cases of the disease so generally as to justify the inference that they are uniform effects of the poison.

THERAPEUTICS.—On the treatment of canine madness, information is not less deficient than on the pathology. As in every disease for which no remedy is known, every method, however opposite, has been tried, and all with equal want of success. Under such circumstances, to enumerate all the means which at different times have been employed as preventives or as cures must be irksome; while its utility is limited to demonstrate the credulity of mankind, and to proclaim the melancholy fact, that for genuine hydrophobia a remedy is still unknown.

This conviction, more or less complete, with the notion that all the symptoms depend on the operation of a material poisonous principle, early suggested the use of such means as were conceived to eradicate the poison at the moment of insertion, or to counteract by specific powers its noxious influence on the living body.

The ancient practice of sucking venomous wounds, recommended on the same principle as in those inflicted by rabid animals, is an instance of the first; and if it could be adopted with-

out danger to the operator, it might be productive of benefit. But it is obvious that no one can suck such a wound without inflicting on himself the evil which he wishes to avert from another. This objection, however, may be obviated by the use of the cupping-glass, preceded by diligent ablution.

Excision of the bitten parts, destruction by powerful chemical caustics, or searing by hot iron, have been at different periods recommended, and practised with various degrees of confidence. Experience, however, has shown, that whether from inadequate application, from too late performance, or from other unknown causes, these are not more successful than other means. It is probable that the principal source of failure in this case is the difficulty, amounting almost to impossibility, of making either the knife, the caustic, or the hot iron, penetrate every recess of a punctured wound, made by such instruments as the canine and incisive teeth of the dog or wolf.

Among agents supposed to possess specific powers as antidotes, the oldest and the most absurd is the powder of Palmarius; the most harmless are that of Dampier, recommended by Dr Mead, (*Pulvis Antilyssus*, consisting of ash-coloured liverwort and black pepper,) and the Ormskirk medicine; the most celebrated are the Tonquin medicine, the Tanjore or tonic pills, and mercurial frictions; and the most fanciful are extract of deadly nightshade, vinegar, and the aqueous solution of chlorine; all equally useless. Of the temporary and factitious repute acquired by these medicines, the source is almost universally the same. One or other of them have been used by persons bitten by dogs supposed to be mad; and, as these escaped the disease, the supposed immunity was ascribed to the medicine taken; or symptoms similar to rabies only have appeared, and have been forthwith regarded as those of the genuine disease, which was thus supposed to be subdued and removed. Employed in genuine hydrophobia, all without exception have shared the same fate, and have shown that none of them are antidotes to the rabid poison.

When the composition, indeed, of some of these remedies is considered, it is impossible not to be surprised at the simplicity which should have ascribed such powers to such remedies. The Ormskirk medicine, which was long and much used in the north and west of England, in all cases, real or supposed, of canine madness, consisted of chalk, alum, Armenian bole, elecampane root in powder, and a few drops of oil

of anise; and none of these ingredients, either separately or conjointly, can be supposed, either by analogy or by their known physiological effects, to have the smallest influence in counteracting the operation of an animal poison. The Tonquin medicine, composed of musk and cinnabar, and introduced by Sir George Cobb of Busselton, might be justly supposed to be a more energetic agent; but this can be only so far as it contains a mercurial preparation; and the fullest trial both of the original compound, and of the mineral in the more obvious and not less active form of mercurial friction, as recommended by James, Sauvages, Houlston, and many others, shows that it is quite as inefficient as the multifarious combination of vegetables recommended by Palmarius, or the liverwort and black pepper of Mead. Of the Tanjore or tonic pills, the active ingredients are white arsenic, (oxide,) and quicksilver killed by juice of wild cotton; and though it has never yet got a very extensive trial, there is no reason to suppose, considering the nature of its constituent parts, that it would be more fortunate than the others.

The gastric juice of a healthy animal has been recommended by Percival to be applied to the wound as an antidote. There is no reason, however, to think that this substance possesses any properties which could either counteract or render inert the rabid poison; and it is likely that its application would have no other effect than that of allowing the only season for energetic measures to pass away unimproved.

The same may be said of sea-bathing and the cold bath, the apparent success of which, in doubtful cases, like that of Elizabeth Bryant, (Nugent,) naturally procured it considerable celebrity. In cases of genuine disease resulting from the operation of the rabid virus it is not more efficacious than the others.

The efforts of medicine to remove the disease when established have been equally abortive as in preventing its formation after the poison is applied. In general they have been confined to the repeated exhibition of the Tonquin medicine, the employment of blood-letting to a large amount, and the administration of opiates and antispasmodic medicines.

Of the merits of the Tonquin medicine I have already spoken. Mercury administered so as to cause salivation is to be viewed in the same light. It would be a useless waste of time to recapitulate even the principal cases of rabies in which the full and thorough application of this remedy has failed.

Many are found in the English periodical works, (Parry,) in the Memoirs of the Royal Society of Medicine, and in the work of M. Trollet.

Blood-letting to a large amount was thought to be an appropriate remedy by those whose opinion it was, that the symptoms of hydrophobia depended on inflammation. It was tried first by Poupart, Hillary, Hartley, Peters, and Grisley, with apparent success, by Dr Rutherford of Edinburgh without success, and afterwards by Mr Tymon and Dr Schoolbred of Calcutta, with the effect of removing the symptoms under which the patients laboured. No doubt can be entertained, however, that while the case treated by Dr Rutherford was an instance of true *rabies*, that of Mr Tymon was obviously frenzy, (Parry,) and that of Dr Shoolbred not hydrophobia, but some acute cerebral disease, with tetanic symptoms. The same remark may be applied to the case reported by Dr Arnold as hydrophobia, and said to be cured by the application of 46 leeches to the head; and to others recorded by different authors.

This remedy has undergone a full and satisfactory trial in the hands of Dr C. H. Parry of Bath, Sir George Ballingall, Dr Albers of Bremen, Dr Cobb of London, and M. Trollet; and it must require very great faith, indeed, to think that it can be of the least benefit in alleviating or curing such a malady. That the disease is not inflammatory, and that the appearances of inflammation are deceptive, has been already shown; and the antiphlogistic treatment, so far as inflammation is concerned, is justified neither in theory nor in experience.

Opium, though recommended on theory, and given in almost every case of the disease, is not entitled to greater confidence. It was tried in a very efficacious form by Dupuytren and Magendie, who injected its watery solution into the veins; but though this was done after copious and repeated blood-letting, the fate of the patient was not even retarded.

It may therefore be given as a general conclusion, that *rabies* when established is incurable; and that the efforts of the medical attendant must be limited to the treatment of the local injury. For conducting this properly three precepts seem to present all that can be expected of human aid; 1st, careful and assiduous ablution of the part; 2d, the judicious and prompt application of the cupping-glass; 3dly, the use of one or other of the fluid chemical caustics.

Ablution.—The first thing to be done to a part bitten by a dog suspected to be rabid, is to wipe it well with dry cloth, so as to remove all slaver or morbid mucus, and then immediately to wash the wound and all its parts carefully and repeatedly with cold water. When this has been done with considerable care, a stream of warm water should be poured from the spout of a tea-pot or tea-kettle, forcibly, abundantly, and with persevering attention; in some cases where the wounds are deep and complicated, for several hours. (Haygarth.) In this manner, there is reason to believe every particle of morbid matter may be certainly detached from the wound.

Cupping.—The effect of ablution will be much augmented by combining at intervals, the use of a good cupping-glass and syringe. By forming an accurate vacuum over the wounds, whatever loose fluid is left at the bottom will be forced towards the surface, from which it may be removed by renewed washing. In most, perhaps all instances, it will be expedient to dilate the wounds by carrying conical incisions through them where practicable. This not only allows the water to reach their innermost recesses and tortuosities, but facilitates greatly the extraction of morbid saliva or mucus, by the cupping-glass and syringe.

Fluid Caustics.—It has been stated above, that, abstracting from the too late performance of the operation, the occurrence of rabies in cases in which the wound has been cut out, seared, or treated with caustic, is to be ascribed chiefly to the difficulty of making either of these agents penetrate all the tortuous recesses of a bitten wound. This objection will be best obviated by employing, after the prompt use of the means above-mentioned, any of the fluid chemical caustics. The pure potass, which attracts moisture the moment it comes in contact with the air, answers this purpose very well; and its fluidity enables it to flow into almost every division of a complicated punctured wound. It appears from the testimony of Mr Simmons, that the application of this remedy to bitten wounds has been practised for more than 30 years at the Manchester Infirmary, (Ferriar), with the constant effect of preventing the subsequent disease; and though it is not probable that all the persons so bitten must have taken it, though not treated in this manner, yet it is reasonable enough to ascribe some, if not considerable merit to the peculiar qualities of the caustic potass. With the same view, concentrated sulphuric or nitric acid may be used.

In France the prevailing taste seems to be in favour of the butter of antimony (hydrochlorate), which is semifluid and sufficiently powerful as an escharotic, but in this particular case not equal, perhaps, to the caustic potass, the operation of which is prompt, energetic, and complete.

After the measures now mentioned have been accomplished, the wound may be dressed simply, and treated in the ordinary way, till the separation of the dead sloughs. If there is much redness and swelling, a light poultice may be applied; but cooling and sedative remedies are in general most expedient. Some have recommended irritating and stimulating dressings, with the view of maintaining a copious discharge, and keeping it long open. This practice, which seems to be derived from the notions of the humoral theory, possesses nothing to recommend it. If the poisonous matter is not detached by ablution, cupping, and the fluid caustics, no irritating applications whatever, and no discharge, however long continued, will avail in expelling it. If it has been detached by the first measures, all others are unnecessary and superfluous; and the sooner the wounds are healed the better.

§. VII. Neuropathy. Tic Douloureux. *Neuropathia. Neuralgia. Prosopalgia. Rachialgia.*

Ludwig, *Adversaria Medico-Practica*, Vol. i. Pars iv. p. 717. *Tractatio de Doloribus ad Spinam Dorsi*. Lipsiæ, 1770.—*De Vertebralis Columnæ in Morbis Dignitate*. Oratio Acad. ext. A J. P. Frank. *Delectu Opusc. Medicor.* Vol. xi. Ticini, 1792.—*Observations on a Stridulous Affection of the Bowels; and on some varieties of Spinal Disease, &c.* By J. Bradley, M. D. London, 1818.—J. F. Lobstein *de Nervi Sympathetic Humani Fabrica, Usu et Morbis Commentatio*. Paris, 1823. 4to.—*On Irritation of the Spinal Nerves*. By Thomas Brown, M. D. Senior Physician to the R. Infirmary of Glasgow. *Glasgow Med. Journal*, 1828.—*Observations on some forms of Spinal and Cerebral Irritation*. By John Darwall, M. D., *Midland Medical and Surgical Reporter*, May 1829.—*A Treatise on Neuralgic Diseases dependent upon Irritation of the Spinal Marrow and Ganglion of the Sympathetic Nerve*. By John Pridgin Teale, M. R. C. Surgeons, London. London, 1829.—*Observations on the Disorders of Females connected with Uterine Irritation*. By Thomas Addison, M. D. London, 1830.—*Observations on Functional Affections of the Spinal Cord and Ganglionic System of Nerves, in which their identity with Sympathetic, Nervous, and Imitative Diseases is illustrated*. By William Griffin, M. D., M. R. C. S. E. &c., and by Daniel Griffin, M. R. C. S. L. &c. London, 1834.—*An Exposition of the Symptoms, Essential Nature, and Treatment of Neuropathy, or Nervousness*. By James Manby Gully, M. D. &c. London. 1837.—*A Treatise on Neuralgia*. By Richard Rowland, M. D., M. R. C. P. L., &c. London, 1838.

UNDER this and the following section, I shall treat very

shortly of two affections, the one perhaps allied to various morbid states of the nerves, their branches, their ganglions, or their plexuses; the other dependent on, or connected with, certain morbid states, dynamic or organic, of the brain and its investments.

Under the name Neuropathy and Neuralgia are included many disorders, in which the prominent symptoms of suffering are very disproportionate to the physical or material pathological cause by which they seem to be produced. Thus pains, often severe and excruciating, are felt in various parts, which, both from the circumstance of their undergoing spontaneous remission or alleviation, and from their not being always connected with manifest organic changes, are regarded as dependent on a morbid state of the nerves connected with, or distributed to the part. Thus, though pain is felt in one or more parts in a very acute and intense degree, it does not indicate, or is connected with, the corresponding degree either of inflammatory action or its products, which is observed to take place in ordinary circumstances,—it is not connected with the same amount of general disorder of the functions,—nor is it accompanied by corresponding degrees of wasting and loss of strength.

The forms in which these affections appear are multiplied and various; but I would here refer them all to three general heads; first, *Rachialgia*, or spine-ach, including painful sensations in some part of the spinal column; second, *Neuropathia*, or general wandering feelings of uneasiness or pain, not confined to one point, but affecting simultaneously or successively many different and sometimes remote parts and organs; and, thirdly, *Neuralgia*, or nerve-ach, embracing all those acute, intense pains, generally of a lacerating, shooting, or piercing character, which sometimes are referable to nervous trunks or branches, sometimes to parts or organs in which nerves are distributed.

1. The first variety, *Rachialgia*, or spine-ach, includes all those uneasy and painful sensations referred to the spine, which are described under the general name of Spinal Irritation. They are often evidently connected with accumulation of blood in the rachidial veins; sometimes they are connected with irritation in the intestinal tube and intestinal ends of the splanchnic nerves, whence they are conveyed by reflected action to the spinal connections of these nerves; and in several cases they

are manifestly dependent upon disorder and irritation in the uterus and uterine nerves. In the last case, and in the second even, these pains are evidently connected with the chronic hysterical disposition already described.

2. The second variety, *Neuropathia*, or general nervousness, is evidently very closely allied to, if not quite the same as, the chronic hysterical, and the hypochondriacal diathesis. Medical and pathological inquirers have not yet agreed upon the particular part of the frame which is primarily disordered in this proteiform indisposition; whether one part of the nervous system, as the gangliar and splanchnic, or the cerebro-spinal axis is affected first; or several parts are simultaneously disordered. It seems most likely that the part first affected is the system of the splanchnic nerves; but there is also good ground to believe, that the circulation of the skin and of the muscular system is also much disordered, and that in this manner the nervous apparatus may be disordered, and react on the gastro-pulmonary and gastro-enteric nerves.

3. Of the third variety it is impossible to speak here at sufficient length to do the subject justice. It is known that neuralgia may affect almost any nerve, though those of the face are the most frequent seats of the malady; and the disease is then known by the name of Face-ach; (*prosopalgia*.) It is also known that these painful feelings, though sometimes not traceable to any perceptible lesion, may depend on inflammation of the neurilema, or of the nerve, on neuromatous tubercles or tumours, or other irritations, sometimes those of an adjoining bone. (See Elements of Morbid Anatomy.)

Neuralgic pains may affect any organ of the body; but the parts most usually affected are the breast in females, and occasionally the uterus and ovaries, and in males, the testicle, and sometimes the penis.

In the treatment of these disorders much unsteadiness and empiricism are perceptible; and it is difficult to sketch any rational or successful method of management. The remedies may be referred to the following heads.

Local depletion and fomentations; anodyne applications; revulsion by means of sinapisms, blisters, cauteries, and exultories in general.

Anodyne remedies, and those which allay irritation; as opium, nightshade, henbane, hemlock, wolfsbane, and similar agents of narcotic properties.

Remedies acting by improving the functions of the alimentary canal; eccoprotics, antacids, and tonics; croton-oil; calomel; aloetics.

Remedies which act by improving the cutaneous circulation and muscular action; the warm and tepid bath, friction, exercise, gestation, sailing, riding on horseback; electro-magnetism.

Remedies which act partly in the manner now specified, partly as antiperiodics; iron, sulphate of quinine, arsenic.

Remedies which act or are supposed to act on the uterine circulation and secretion; local depletion; injections of acetate of lead, nitrate of silver, chlorine liquor; chalybeates, especially sulphate of iron and aloes; sinapised baths; and electro-magnetism.

§. VIII. Madness; Woodness, Old Eng. from German Wuth. Lunacy; Insanity; Mental Derangement; Melancholy. *Mania. Vesania. Monomania. Dementia; Fatuitas. Wahnsinn. Narrheit.*

Arrigoni Della Mania, della Frenesia, et della Rabbia, 1757.—A Treatise on Madness. By William Battie, M. D., &c. London, 1758. 4to. Pp. 99.—Remarks on Dr Battie's Treatise on Madness. By John Monro, M. D. 8vo. Pp. 60. London, 1758.—De Melancholia et Morbis Melancholicis, auct. A. C. Lorry. 2 Tome 8vo. Paris, 1765.—Ernesti G. Bose, P., et Carol. G. Deutrich de Morbis Mentis delicta excusantibus. Lipsiæ, 1774. Frank. Delectus, ix. p. 93.—Heidsik Abhandlung von den Ursachen der Ietziger Zeit so oft entstehenden Verruckungen, und wie dieselben zu beurtheilen, V. Mindensch Anzeig, 1778.—Recherches sur la Melancholie. Par M. Andry. Paris, 1782.—Observations on the Nature, Kinds, Causes, and Prevention of Insanity, Lunacy, or Madness. By Thomas Arnold, M. D. 2 vols. Leicester and London. Vol. i. 1782; Vol. ii. 1786.—Annals of Insanity; comprising a selection of Cases in the different species of Insanity, Lunacy, or Madness, with the modes of practice as adopted in the treatment of each. By William Perfect, M. D. Rochester, 1787. 8vo. Pp. 335. A new edition of this in 1795, 1799, and 1801. Pp. 412.—Observations on the Treatment of Insanity. By B. Faulkner. 8vo. London, 1790.—Observations on Maniacal Disorders. By William Pargeter, M. D. Reading, 1792. 8vo. Pp. 140.—Medical Histories and Reflections, in 3 vols. 8vo. By John Ferriar, M. D. Warrington, 1792–98. Vol. i. Remedies of Insanity, p. 214. Vol. ii. of Insanity, p. 109. A new edition in 1810. London. 4 vols. See Vol. i. and ii.—Della Pazzia in Genera, e in Specie; Trattato Medico-Analitico Conuna Centurion de Osservazioni. Di Vincenzo Chiarugi D. M. Prof. de Medecina, &c. iii. Tom. Firenze, 1793–1794. 8vo. Pp. 221, 222, and 240.—An Inquiry into the Nature and Origin of Mental Derangement; comprehending a concise System of the Physiology and Pathology of the Human Mind, and a History of the Passions and their effects. By Alexander Crichton, M. D., &c. &c. 2 volumes 8vo. London, 1798.—Traité du Cretinisme. Par F. E. Foderé. Paris, 1800. 8vo.—Practical Observations on Insanity, &c. &c.; to which are subjoined Remarks on Medical Jurisprudence,

as connected with Deranged Intellect. By Joseph Mason Cox, M. D. &c. London, 1804. 8vo. Pp. 170.—Observations on Madness and Melancholy; including Practical Remarks on these diseases; together with Cases and an Account of the Morbid Appearances on Dissection. By John Haslam, late of Pembroke Hall, Cambridge, Member of the Royal College of Surgeons, and Apothecary to Bethlem Hospital. 2d edition. London, 1809. 8vo. Pp. 335.—*Traité Medico-Philosophique sur l'Aliénation Mentale.* Par Ph. Pinel. Médecin, &c. &c. 2de édition. A Paris, 1809.—Address concerning a Lunatic Asylum. 4to. Edin. 1807.—Observations on Lunatic Asylums, 4to, Edin. 1809. By A. Duncan, M. D.—An Inquiry, &c. on the Number of the Insane; &c. By W. S. Hallaran, M. D. Cork, 1810.—Practical Remarks on Insanity. By Bryan Crowther, M. R. C. Surgeons, London. London, 1811. 8vo.—Description of the Retreat, an Institution near York, for Insane Persons of the Society of Friends; containing an Account of the Origin and Progress, the Modes of Treatment, and a Statement of Cases. By Samuel Tuke. York, 1813. 4to. Pp. 227.—Observations on the Comparative Prevalence of Insanity at Different Periods. By Richard Powell, M. D. Med. Trans. iv. p. 131. London, 1813.—An Essay on the Prevention and Cure of Insanity. By George Ness Hill, Surgeon, Chester. London, 1814.—The Morbid Anatomy of the Brain in Mania and Hydrophobia, &c.; collected from the papers of the late Andrew Marshall, M. D. London, 1815. 8vo.—*Des Vesanies.* Par J. M. Dubuisson, M. D. Paris, 1816. 8vo.—Remarks on Insanity; founded on the Practice of John Mayo. By Thomas Mayo, M. B. London, 1817. 8vo.—Medical Jurisprudence as it relates to Insanity, according to the law of England. By John Haslam, M. D. London, 1817. 8vo.—*Traité du Delire.* Par F. E. Fodéré. Paris, 1817. 2 tomes, 8vo.—Practical Observations on the Causes and Cure of Insanity. By William Saunders Hallaran, M. D. &c. 2d edit. Cork, 1818. 8vo. Pp. 283.—An Inquiry into certain Errors relative to Insanity, and their consequences, Physical, Moral, and Civil. By George Man Burrows, M. D., F. L. S. &c. &c. London, 1820. 8vo. Pp. 320.—Observations on Puerperal Insanity. By Robert Gooch, M. D. &c. Med. Trans. vi. p. 263. London, 1820.—*De La Folie.* Par M. Georget. Paris, 1820. 8vo.—A Treatise on Diseases of the Nervous System. By J. C. Prichard, M. D. Part I. 8vo. London, 1822.—A Treatise on Mental Derangement; containing the substance of the Gulstonian Lectures for May 1822. By Francis Willis, M. D., Fellow of the R. C. of Physicians. London, 1823, 8vo. Pp. 234.—*Traité des Maladies du Cerveau et des ses Membranes.* Par A. L. J. Bayle, D. M. Paris, 1826.—*De la Paralyse considérée chez les Alienés,* &c. Par L. F. Calmeil, D. M. Paris, 1826.—*Traité sur l'Aliénation Mentale, et sur les Hospices des Alienés.* Par Joseph Guislain, Med. a Gand, Deux Tomes. Pp. 404 and Pp. 359. 8vo. Amsterdam, 1826.—*Des Causes, Morales et Physiques, des Maladies Mentales.* Par F. Voisin. Paris, 1826. 8vo.—Observations on the Causes, Symptoms, and Treatment of Derangement of the Mind, founded on an extensive Moral and Medical Practice in the Treatment of Lunatics. By Paul Slade Knight, M. D. &c. London, 1827. Pp. 167. 8vo.—*Medecine Legale Relative aux Alienés et aux Sourd Muets; ou les Lois Appliquées aux Desordres de l'Intelligence.* Par J. C. Hoffbauer Docteur en droit, &c.; Traduit de l'Allemand. Par A. M. Chambeyron, D. M. Avec des Notes. Par MM. Esquirol et Itard. Paris, 1827. 8vo. Pp. 388.—Commentaries on the Causes, Forms, Symptoms, and Treatment, Moral and Medical, of Insanity. By George Man Burrows, M. D., &c. London, 1828. 8vo. Pp. 716.—Practical Observations on Insanity, and on the Treatment of the Insane, &c. By W. J. late keeper at a Lunatic Asylum. London, 1828. Pp. 127.—Remarks on the Treatment of the Insane, and the

Management of Lunatic Asylums, &c. By E. P. Charlesworth, M. D. one of the Physicians of the Lunatic Asylum. London, 1828. 8vo. Pp. 39.—A General View of the present state of Lunatics and Lunatic Asylums in Great Britain and Ireland, and in some other kingdoms. By Sir A. Halliday, K. H. M. D. &c. London, 1828. 8vo. Pp. 101.—A Letter to Lord Robert Seymour; with a Report of the number of Lunatics and Idiots in England and Wales. By Sir Andrew Halliday, K. H., M. D. London, 1829. Pp. 38. 8vo.—Remarks on Nervous and Mental Disorders, with especial reference to recent investigations on the subject of Insanity. By David Uwins, M. D. London, 1830. 8vo. Pp. 41.—An Inquiry concerning the Indications of Insanity. By John Conolly, M. D. London, 1830. 8vo. Pp. 496.—A Treatise on those Disorders of the Brain and Nervous System which are usually considered and called Mental. By David Uwins, M. D. London, 1833. 8vo. Pp. 235.—Observations on the Illusions of the Insane, and on the Medico-Legal Question of them compared. Translated from the French of M. Esquirol. By William Liddell, M. R. C. Surgeons. London, 1833. 8vo. Pp. 89.—Sketches from the Case Book to illustrate the influence of the Mind on the Body, with the Treatment of some of the more important Brain and Nervous Disturbances which arise from this influence. By R. Fletcher, Esq. Surgeon to the Gloucester Hospital. London, 1833. 8vo. Pp. 391.—Essay on the Classification of the Insane. By M. Allen, M. D. London, no date, but published in 1833. 8vo. Pp. 212.—*Traité sur les Phrenopathies ou Doctrine Nouvelle des Maladies Mentales.* Par Joseph Guislain. Bruxelles, 1833. 8vo.—An Essay on the Relation of the Theory of Morals to Insanity. By T. Mayo, M. D., F. R. C. P. London, 1834. 8vo. Pp. 49.—A Treatise on Insanity, and other disorders affecting the Mind. By James Cowles Prichard, M. D., F. R. S., &c. London, 1835. 8vo. Pp. 483.—On Insanity; its Nature, Causes, and Cure. By William B. Neville, Esq. of Earle's Court House. London, 1836. 8vo. Pp. 192.—A Treatise on the Nature, Symptoms, Causes, and Treatment of Insanity; with Practical Observations on Lunatic Asylums, &c. By Sir W. C. Ellis, M. D. London, 1838. 8vo. Pp. 344.—*Des Maladies Mentales Considérées sous les Rapports Medical, Hygienique, et Medico-Legal.* Par E. Esquirol, Med. en Chef de la Maison Royale des Alienés de Charenton, &c. 8vo. Paris, 1838. Deux Tomes, Pp. 678 and 864.—A Treatise on the Medical Jurisprudence of Insanity. By J. Ray, M. D. Edinburgh, 1839. 8vo. Pp. 326.

NOTHING is more difficult than to give an unobjectionable definition of mental derangement. Though in extreme cases the disorder is pretty distinctly marked, yet there are many instances in which, from various causes, it is difficult to select and specify the exact circumstances which essentially constitute mental derangement. It is next to impossible, consequently, to expect any definition that can be given to be free from objection.

It may nevertheless be said, that madness, lunacy, mental derangement or insanity, in the most extensive acceptation, consists in that morbid state of the brain, dynamic or organic, usually sub-acute or chronic, in which sensibility, intellect, will, or the moral affections, are more or less perverted, disturbed, or deranged, or are prevented from being exercised in the normal manner.

Of this disorder, various forms are presented ; and perhaps the easiest mode of communicating a clear idea of the different aspects under which madness appears, is the following.

Every human being at some time after birth, if he possess the usual complement of organs, and if these organs be in the average state as to size, growth, number, and perfection of parts, begins to show certain powers of observation and attention ; to exhibit emotions and feelings, preferences for certain objects, and dislike to others ; to form judgments, and to act on them. He also begins to show memory, or proofs of recollection, and to form judgments from that source of information.

The several faculties now mentioned may either not be developed at all, and the individual shows no capacity of exercising them ; or, after being developed in a degree more or less considerable, sometimes to their full extent, in other instances, to a very extraordinary degree beyond those of other individuals of the race, they undergo more or less disorder, either in the way of perversion or subversion more or less complete.

In the first case, the state of mind is denominated imbecility or feebleness of understanding ; and the persons presenting it are said to be imbecile or silly. In the second case, the state of mind is designated by the general name of madness, mental derangement, or simply derangement or insanity. In the former case, the individual never possessed, and could consequently not exercise his mental faculties. In the latter case, though he at one time possessed these faculties, some change had taken place in the condition of his brain, dynamic or organic, in consequence of which he either exercises them erroneously, or is unable to exercise them at all.

I. Imbecility may be distinguished into two varieties, according to the degrees in which it appears. Thus it is observed, that sometimes with privation of two or more of the senses, as sight, hearing, smell, taste, and often with deafness and dumbness united, the individual seems to be void of all the mental faculties, perception, attention, memory, and judgment. This complete and perhaps extreme condition of imbecility is distinguished by the name of idiocy, (*Dummheit*) ; and the individual labouring under such infirmity is designated an idiot. This form of imbecility is most usually the consequence of some disorder of the brain or its coverings, taking place either in the womb, or very early after birth, not intense enough to

destroy life, but sufficiently severe to stop the developement of the brain, or of some of its parts, or to change the structure of the organ so much as to disable the individual from exercising his mental faculties.

In another form of this infirmity, several of the mental faculties may be left in a state sufficiently entire to admit of some degree of exercise, while of one or two there is no indication of the existence ; or one may be very powerful while the others are scarcely in existence ; or the whole may be left in a very feeble and limited state. Thus sensation and perception, and the power of observation, may be much impaired ; attention, memory, and judgment, may be feeble ; or with some power of memory all the others may be much weakened ; or perception, attention, memory, and judgment, are all equally curtailed and enfeebled. This state of mind constitutes imbecility or silliness, properly so named. (Bloedsinn.) It is usually the consequence of some lesion of the brain, less violent in degree and less extensive in range than that which has caused idiocy. This may take place either at birth or soon after ; or it may take place at a period when the mental faculties have proceeded to some extent in the process of developement. It is often the result of some acute or sub-acute disorder of the brain or its membranes.

II. Madness or lunacy, which consists in disorder taking place in the mental faculties after they have been more or less fully developed, is an infirmity altogether different. Instead of the different mental faculties being, as in imbecility, enfeebled or extinguished, they are put in disorder or confusion. The individual possesses the faculties ; but he has lost for the time the power of exercising them properly and in due order. The manner in which this confusion takes place may vary. The power of recollecting may be gone. The power of pursuing one train of thought may be gone, or it is interrupted by extraneous ideas, which the patient has not the faculty of excluding. Or he loses the faculty of comparing one or more ideas, and forming new combinations. This disorder may be distinguished, according to its forms and degrees, into the following varieties.

1. Mania proper, in which all the faculties are exalted, and in which reason no longer exerts any control over the passions and appetites. (Tollheit.)

2. *Dementia* (*Amentia*), or derangement with depression and

enfeebling of all the faculties,—a variety of mental disorder approaching very closely to silliness or imbecility.

The first disorder, mania, may either be general, so that the individual is deranged in all respects, which constitutes the *Insania universalis* of Cullen, the *Polymania* of Esquirol, in which the patient thinks erroneously upon almost all subjects; or partial,—forming *Monomania*, in which the derangement turns upon one subject, or so small a number of subjects, that the individual thinks correctly and reasonably upon all others.

Mania proper, or *Polymania*, may be either with or without fury and violence. In the former case there is general violence in conduct and demeanour, great obstinacy, intolerance of contradiction or opposition, and frequent accessions of furious outbreaks into passion. In the latter, there are often cunning, sullenness, various illusions, and a vicious and confused association of ideas. The whole nervous system in mania seems exalted and excited; the ideas are confused and crowd on the mind without the power of arranging them; the faculties of the understanding are confused and overturned; and even the fancies of patients are converted into actual beings which excite and disorder them.

Monomania presents several varieties, according to the character which the derangement assumes.

a. *Monomania* may be accompanied with gloomy mournful images, with apprehension of evil and calamity, with the belief of actual misfortune, loss of means, disgrace, or other causes of suffering. This, which constitutes the melancholy of the ancients and most modern authors, as Shakespeare, Burton, and Milton, is the *Melancholia* and *Hypochondriasis* of Sauvages and Sagar, the *Melancholia* of Vogel and Cullen, the *Tristimania* of Rush, the melancholy with delirium of Pinel, and, more accurately, the *Lypemania*, ($\lambda\upsilon\pi\eta$, dolor, $\mu\alpha\nu\omicron\mu\alpha\iota$, *furor*,) of Esquirol.

Lypemania comprehends probably several varieties; but two are manifestly referable to this head; the homesickness, (*Heimweh* or *Nostalgia*,) experienced by many strangers; and the tendency to self-destruction with which it is often accompanied.

b. *Monomania* may, in consequence of the mind being diverted to religious considerations, and from the dread, real or imaginary, of having committed some heinous sin, assume the aspect of incessant dread of the Supreme Being, or of the judgment and vengeance of heaven; or the patient may fancy that he is under the influence of an evil spirit, or of unavoida-

ble fate, or predestination to evil; or conversely, that he is under the particular guardianship and protection of heaven. It is not easy to apply to this form of *monomania* a name appropriate and free from objection. Sauvages and Sagar gave it the denomination of *Dæmonomania*, from the circumstance that the subjects believed themselves possessed by or under the influence of an evil spirit. But this view is much too limited; as there are many examples of this form of mental disorder in which the individual has no such opinion. For one variety, Esquirol would propose the term *theomania*, and for the other *caco-dæmonomania*; but, from the dread of the charge of neology, refrained; and, as *dæmonomania* had been generally received, he adopts that, restoring it, however, to its original meaning of implying the fancied dominion of a supernatural power only, without reference to its good or evil influence.

In the present day, when this species of disorder most usually depends on erroneous notions of religion and its obligations, mistaken and degrading views of the Supreme Being and his attributes, too often ascribing to him human passions and feelings, it might be properly denominated *Sebastomania*.

c. The predominant ideas in monomania may be of a cheerful, joyous, and exalted character. The individual fancies himself possessed of inexhaustible wealth, in high honour, a prince, a king, a divinity, beloved by a princess, the companion of monarchs and nobles. As in this variety of derangement, all the faculties are not disordered, and there is often considerable, nay remarkable, degree of reasoning power, the patient drawing conclusions, though from false, erroneous, and imaginary premises, Pinel applied to it the name of *reasoning mania*; and others have called it monomania without delirium. As it is commonly attended with pleasurable and gay images, and as the patients are disposed to view all things in a happy light, and to regard their condition, fortune, rank, and prospects, as better and higher than they really are, Rush applied to it the term *Amœnomania*, a hybrid and heterogeneous compound of a Roman and Grecian primitive. Chambeyron has given the more becoming, if not more appropriate term of *Chairomania*, (*χαίρω, gaudeo, μαινομαι, furor.*) This corresponds to the German term *Narrheit*, the *Mania Moria* of Joseph Frank. It is denominated by Esquirol simply *Monomania*.

It embraces several varieties. The first is *Erotomania*, or that state of mind in which the maniacal illusions receive their

first impulse from the passion of love. The second is the proper reasoning monomania, in which most of the feelings become perverted, and sometimes entirely reversed from their natural and proper character ; but in which, nevertheless, the individual acts and thinks consistently, though from erroneous notions and false impressions. The mania of drunkards, or what I have already considered as the subacute or chronic form of methystic delirium, Esquirol refers to the third head.

Another variety of derangement, which must be referred to this head, is that which Pinel has described under the name of mania without delirium, and Prichard under that of moral insanity. This is distinguished by want of primary lesion of the understanding, and a remarkable perversion of all the moral qualities and social affections, incapacity to distinguish the differences between good and bad conduct, violent and immediate indulgence of the passions, with disregard to the consequences, and hence great recklessness and irregularity as well as outrage of behaviour. In this variety, when the understanding shows marks of disorder, these are the effect of the perversion, derangement and disorder, in the moral qualities.

To this head may be referred the homicidal monomania, and all those examples of outrageous and violent conduct in which the moral law is recklessly violated. Of this disorder numerous examples are given by Gall and Spurzheim in their large work on the Anatomy and Physiology of the Nervous System. Though these instances are adduced as examples of the effect of the large developement of particular regions of the brain, no doubt can be entertained that they are instances of persons labouring under this particular form of insanity,—a perversion of all the usual feelings and affections and great derangement in, or a total want of, the moral faculty.

The whole of these varieties of derangement are more or less related to each other. Sometimes they alternate with each other ; sometimes they are associated ; and sometimes they pass into each other. The most usual order is the following ; monomania of one kind or other, mania, and finally, fatuity or *dementia*, or extreme feebleness, or complete extinction of the faculties.

These distinctions, it must nevertheless be observed, are founded chiefly on differences in symptoms ; and these differences cannot be always made to correspond with specific morbid changes. On the other hand, it is found, that, though very

great changes are often observed in the extreme cases of dementia and idiocy, yet very different and disproportionate changes in the brain and its membranes are found in cases of monomania and mania. For a full account of these changes I must refer to the *Elements of Morbid Anatomy*.

One point requires to be noticed in reference to treatment. Many instances of monomania appear at first to be connected with subacute inflammation of the cerebral membranes. If this be allowed to go on, or if from its gradual and insidious progress it creeps on unopposed, it is liable to produce changes so considerable, and injury so irreparable, that it renders the patient incurably maniacal or fatuous for life. Insanity, indeed, has often this termination. But it is also liable to be associated with epilepsy, palsy, and especially a sort of paralytic shaking, which is liable to terminate in lethargy or apoplexy.

Treatment is of three kinds—medical, moral, and economical.

The medical treatment of insanity consists, 1. in diminishing or removing the indications of meningeal or cerebral disorder, by means of blood-letting, general and local, cold applications to the shaven scalp, revulsion by means of blisters, and by the use of laxatives and eccoprotics; 2. in allaying sources of irritation, procuring sleep, tranquillizing the system by means of the use of tartar emetic, the warm bath, the tepid bath, the judicious use of opiates, and keeping the patient in a state of seclusion, and protection from all sources of irritation; and 3. in supporting strength by giving proper food, and taking care that food is administered.

The moral treatment consists in giving the mind occupation with proper objects, in imparting in proper cases moral and religious instruction, in furnishing amusement, information, or consolation, and in the due regulation and management of all the feelings, appetites, passions, and intellectual faculties.

Under the head of economical treatment are included all those measures which are adopted for the attendance, security, and comfort of the insane, and keeping them in such situations that they may be sheltered from causes of irritation and excitement, and shall neither injure themselves nor any other person. The details of these measures would lead me beyond the limits of a treatise of this kind; and for minute information I refer to the authors who have written on the subject expressly.

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ERRATA ET CORRIGENDA.

VOLUME I.

- Page 431, last line, *for disappearance read appearance.*
 ——— 471, line 9 from foot, *for on matters read or matters.*
 ——— 501, line 9 from foot, *for nephritic read syphilitic.*

VOLUME II.

- Page 29, line 34, *for after red it lose read often it loses.*
 ——— 84, line 25, *for chronic read acute.*
 ——— 352, line 19, *for meningeal derangement read mental derangement.*
 ——— 535, after line 23, *insert Chapter VI.*
 ——— 541, line 19, *for febrile read fertile.*
 ——— 652, line 10, *for never impaired read much impaired.*
 ——— 656, line 5 from foot, *for universally read anciently.*
 ——— 728, line 28, *for the stalactitic read termed stalactitic.*
 ——— 1039, line 12, *for anterior read interior.*
 ——— 1097, line 24, *for suspected read suspended.*
 ——— 1215, line 10 from foot, *for loss of time read loss of tone.*

THE END.

